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Cancela da Fonseca (J.). **Contribuição para o estudo do** *Coccus hesperidum* **L. (Hemiptera Coccoidea). I. Estudo sistemático e morfológico.** [A Contribution to the Study of *C. hesperidum*. I. Systematic and morphological Study.]—*Brotéria* **49** fasc. 1–2 pp. 5–53; fasc. 3 pp. 97–114, 15 figs., many refs. Lisbon, 1953. (With Summaries in French and English.) **II. Subsídios para o estudo da sua biologia e ecologia.** [II. Materials for the Study of its Bionomics and Ecology.]—*Op. cit.* **50** fasc. 2–3 pp. 53–93; fasc. 4 pp. 149–173; **51** fasc. 1 pp. 38–51; fasc. 4 pp. 161–173; **52** fasc. 1 pp. 19–35, 16 figs., 2 maps, many refs. 1954–56. (With a Summary in French.)

Coccus hesperidum L. is a minor pest of *Citrus* in Portugal, attacking mainly orange and tangerine orange, and has been reported as particularly injurious near Oporto. In the first part of this work, the author reviews its systematic position, synonymy and economic importance in various countries, discusses the preparation of specimens and describes all stages of the female from Portuguese material. Males were not found in that country, and descriptions of them are cited from the literature.

In the second part, the author discusses the bionomics of the Coccid from the literature and concludes from observations that reproduction in Portugal is entirely parthenogenetic, and that the females are ovoviviparous. When individual females were kept on leaves in petri dishes, the numbers of eggs laid per female and (in brackets) the duration of oviposition in days were 29 (6), 76 (7) and 54 (3) on lemon, 102 (15) and 37 (6) on orange and 9 (2), 41 (6) and 10 (1) on tangerine; all the females died prematurely. The speed at which the crawlers moved varied with temperature, speeds of 1·2–1·8 cm. per minute being observed at 19·5–35°C. [67·1–95°F.]. The influence of temperature, humidity and light on development is reviewed, with special reference to the concept of the thermal constant [*cf. R.A.E.*, A **13** 389], and the number of generations a year at various places in Portugal is discussed. In the laboratory, complete development lasted 63 and 52 days at average temperatures of 21·9 and 24·4°C. [71·42 and 75·92°F.], respectively.

Lists are given showing the parasites and predators of *C. hesperidum* recorded in the world literature, with their distribution, and the ants that are associated with it. Only two insect parasites, *Coccophagus lycimnia* (Wlk.) and *C. scutellaris* (Dalm.), were observed in Portugal, and the literature on them is briefly reviewed. In investigations in 1950, the percentages of females parasitised by these Aphelinids ranged up to 61·5, but were usually very much less. The only fungus observed attacking the Coccid was *Cephalosporium lecanii*, which occasionally gave important control.

The world distribution of *Coccus hesperidum* is shown on maps in relation to climate, and discussed with special reference to Portugal, and lists are given of its food-plants in Portugal, Madeira, Angola, Mozambique and the Azores. All the known food-plants of the Coccid are shown in an appendix.

Ripley (L. B.) & Webb (D. v. W.). **Aerial Oil-spraying of Wattle Plantations against Bagworm.**—*Fmg in S. Afr.* **29** no. 343 pp. 495–498, 1 col. pl. Pretoria, 1954.

Atomised sprays of BHC or toxaphene in mineral oil were known to give good control of the bagworm [*Acanthopsyche junodi* (Heyl.)] on wattle [*Acacia*] in South Africa [*cf. R.A.E.*, A **40** 23–24], but equipment for their

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application from aircraft did not become available until 1951. In October–November 1952, preliminary experiments were carried out with two light Piper aeroplanes, principally to determine the technique of application. Toxaphene was used, and the sprays were applied from a height of about 10–15 ft. above the tops of the trees, at the rate of 2½ gals. light diesel oil, containing 1½ or 3 lb. toxaphene, per acre. The swathe width was 60 ft. Spraying was carried out in all weathers, provided that visibility was sufficient and good navigation possible, and neither moderate wind nor light rain appeared to affect the results. Cover was adequate on small trees and penetration fairly good on large ones, but a rate of 3–4 gals. per acre is thought advisable for the latter. The mortality percentages obtained were generally satisfactory; 1½ lb. toxaphene per acre was sufficient against larvae in the early instars on small or medium-sized trees, and 3 lb. per acre was effective against third-instar larvae on large trees and fourth-instar larvae on small ones. The trees should therefore be sprayed before the larvae reach the fourth instar. When coverage was adequate, the trees remained a bright green and stripping of mature trees was possible. The effect on other insects in the plantations was less than expected.

In 1953, wattle plantations over about 10,000 acres were sprayed with 10 per cent. toxaphene in diesel oil, at 3 gals. spray per acre, again with a swathe width of 60 ft. Samples were collected 5–14 days after spraying, the period increasing with the age of the larvae. Mortality had not reached its height at these times, but was at least 95 per cent. in more than two-thirds of the samples. The dense canopy of large trees hindered spray penetration and reduced mortality to 90 per cent. or a little below. On such trees, mortality was slightly higher in the top half than in the bottom half of the crown, but this mattered little as the majority of the larvae were in the top half. Inferior results obtained in a few cases were due to the trees being missed in plantations in which flags had not been used to mark the swathes. The trees were inspected, mostly from the air, in February, when the damage was at its height, and areas in which the treatment had been successful showed up as bright green. Areas defoliated as a result of irregularities in spraying represented 0–5 per cent. of the trees and about 1 per cent. of the treated surface; such areas are potential foci of reinfestation. In a few instances of abnormally heavy infestation, the clusters of larvae protected one another from the spray sufficiently to allow a small percentage to survive and cause some damage. The white fungus, *Isaria*, and wilt disease [*cf.* **9** 542], which are the principal natural enemies of the Psychid, did not appear to be affected by the treatment, and predacious bugs were also resistant to it. Recommendations for commercial treatments are appended.

CUMBER (R. A.). **The Life-cycle of Humble-bees in New Zealand.**— *N.Z. J. Sci. Tech.* **36** (B) no. 2 pp. 95–107, 1 fig., 7 refs. Wellington, N.Z., 1954.

Species of *Bombus* were introduced from England into New Zealand at the end of last century to aid in the pollination of red-clover seed crops, but it was not realised that this can successfully be done only by long-tongued species. Of the two that have become widely distributed, *Bombus terrestris* (L.) is short-tongued and of little value, and the long-tongued *B. ruderatus* (F.), which is not the main pollinator in England, is not sufficiently numerous to give satisfactory results. Comparative studies of the life-cycle of these two species were made in southern England [*cf. R.A.E.*, A **42** 209] and a district in the south of the North Island to

determine what modifications had occurred. In New Zealand, the queens and workers of *B. terrestris* were present throughout the year and males at least between December and April and possibly for longer; nests are probably established during May–January. Queens of *B. ruderatus* were in flight only from August until May, and the workers and males appeared only from December to April and from February to April, respectively; nests appear to be founded only in November–December. The nest cycle of the latter has thus been less modified in New Zealand than that of the less desirable *B. terrestris*, and it is possible that, if further species are introduced, modifications will be slighter in long-tongued than in short-tongued species.

LEIDERMAN (L.) & VASCONCELLOS (F. T. C.). **Combate à resinose do abacaxi com modernos inseticidas orgânicos.** [Control of Resinosis of Pineapple with modern organic Insecticides.]—*Biológico* **21** no. 6 pp. 97–103, 2 figs., 6 refs. São Paulo, 1955.

Various organic insecticides were compared in sprays and dusts in São Paulo in 1954–55 for the control of *Thecla basilides* (Geyer), a serious pest of pineapple [*cf. R.A.E.*, A **38** 152]. Aldrin at 0·06 per cent. and parathion at 0·04 per cent. were the most effective of the materials tested in emulsion sprays, giving 82·7 and 78·3 per cent. reduction in the numbers of fruits infested, respectively, as compared with no treatment. In wettable-powder sprays, aldrin at 0·06 per cent. and parathion, BHC and lindane [almost pure γ BHC] at 0·04 per cent. were the best, reducing the numbers of fruits attacked by 85·7, 79·4, 84·1 and 92·1 per cent., respectively. Reductions of 94·3 and 92·4 per cent. were given by dusts of 10 per cent. DDT and chlordane, respectively.

LEIDERMAN (L.). **Experiências de combate ao ácaro causador da ferrugem dos *Citrus*, *Phyllocoptruta oleivora* (Ashm.).** [Experiments on the Control of the Citrus Rust Mite, *P. oleivora*.]—*Biológico* **21** no. 8 pp. 133–139, 1 fig., 7 refs. São Paulo, 1955.

The author describes the damage caused to the leaves and fruits of *Citrus* by *Phyllocoptruta oleivora* (Ashm.), which has recently become a serious pest in parts of the State of São Paulo, reviews the bionomics of this mite from the literature and gives an account of experiments on its control carried out on orange between August 1954 and May 1955. In the first test, various acaricides were applied in sprays on 4th August, 4th November and 1st and 25th February and compared with a spray of 1 per cent. wettable sulphur, applied on the same dates. The percentages of fruits attacked were reduced from 44·7 for no treatment to 9·1 by the sulphur spray and to 14·1, 17·2 and 17·3 by 1 per cent. oil, 0·03 per cent. Dimite [1,1-bis(p-chlorophenyl)ethanol] in an emulsion spray and 1 per cent. p-chlorobenzyl p-chlorophenyl sulphide in a wettable-powder spray, respectively. There were no significant differences between these four treatments, and the remainder gave inferior results. The sulphur spray resulted in an increase of *Chrysomphalus ficus* Ashm. (*aonidum*, auct.). In tests to determine the number and timing of applications, sulphur dusts and lime-sulphur sprays were applied 2–4 times on various combinations of dates, and it was found that two applications, on 25th November and 1st February, and four applications, on 12th August, 25th November, 28th December and 25th February, gave about the best results, the percentages of fruits attacked

being 8·5 and 10·9, respectively, for the dusts and 11·4 and 6·4 for the sprays.

Orlando (A.) & Ribeiro (B. L.). **Ensaios preliminares de contrôle à lagarta gelatinosa dos cafezais por meio de polvilhamentos.** [Preliminary Experiments with Dusts for the Control of *Dalcera abrasa* on Coffee.]—*Biológico* **21** no. 8 pp. 140–146, 1 fig., 3 refs. São Paulo, 1955.

Descriptions are given of all stages of *Dalcera abrasa* H.-S., which occasionally injures coffee in São Paulo [*cf. R.A.E.*, A **41** 422], followed by an account of preliminary laboratory experiments on the control of the larvae by means of insecticidal dusts. These were applied by a partial-vacuum technique already noticed [**37** 471] to larvae, mostly in the last instar, placed on coffee leaves, the diluent was talc, and the amounts of dust released over the base area of nearly 106 sq. ins. were 0·5 and 0·2 gm. At 0·5 gm., the best results were given by 1·5 per cent. BHC, 5 per cent. malathion and 2 per cent. endrin, which gave 100, 95 and 83·3 per cent. mortality, respectively, in 48 hours. Inferior results were given at the lower rate, possibly because of the gelatinous covering of the larvae. Dusts of 1·5–2 per cent. BHC were recommended for control, as this insecticide is already widely used in coffee plantations, and proved effective in the field.

Rosillo (M. A.). **Resultados preliminares de un estudio bioecológico de los dipteros Trypetidae del noroeste argentino.** [Preliminary Results of a bio-ecological Study of the Trypetids of north-western Argentina.] —*Rev. Invest. agric.* 7 no. 2 pp. 97–130, 6 graphs, 6 maps, 24 refs. Buenos Aires, 1953.

A survey of the Trypetids present in fruit-growing districts in north-western Argentina was carried out in 1948–50, bait-traps containing a mixture of 25 per cent. wine vinegar and 10 per cent. molasses being hung in *Citrus* and other fruit trees in a group of localities in the Provinces of Jujuy, Salta and Catamarca. Lists are given showing the 12 species of Trypetids taken, of which three were undescribed, and the Diptera of related families. About four-fifths of the Trypetids were *Anastrepha fraterculus* (Wied.), including an undescribed form of this species, and nearly one-sixth were *Ceratitis capitata* (Wied.). *A. fraterculus* was widely distributed, and was particularly numerous at Cafayate (Salta), where it was taken on peach, damson, plum, apple and grape vines. It was commonest in January and February, and *C. capitata* in May and June, and the distribution and population density of these two species are shown on maps. *A. fraterculus* was found to be well established in areas differing climatically, four cited having average monthly temperatures ranging from 13·6 to 26·5°C. [56·48 to 79·7°F.], 11 to 21·8°C. [51·8 to 71·24°F.], 11·5 to 22·4°C. [52·7 to 72·32°F.] and 9 to 21·5°C. [48·2 to 70·7°F.] and widely differing humidity conditions. *C. capitata* was less tolerant of climatic variations, but both species appear to be increasing in distribution.

A. fraterculus was studied in more detail at Cafayate, where the average monthly temperatures ranged from 12·1°C. [53·78°F.] in June–July to 23°C. [73·4°F.] in January and dry conditions prevail. Development from egg to adult was found to last 37 days at 20·5°C. [68·9°F.] and 74 days at 17·5°C. [63·5°F.] and to cease at 14·5°C. [58·1°F.], and it is calculated from this that there are three generations a year, developing in October–

December, January–February and February–March, respectively. Hibernation must occur from April to September, when the average temperature does not exceed 14·5°C. Several wild plants provide host fruits for the development of the Trypetids, and diagrams are given showing the months in which these are available, together with a list of birds that feed on them and thus afford some indirect control of the eggs and larvae.

JAUCH (C.) & OGLOBLIN (A.). **Un hongo parásito de acridios.** [A Fungus parasitising Acridids.]—*Rev. Invest. agric.* **7** no. 3 pp. 193–212, 6 pls., 2 figs., 30 refs. Buenos Aires, 1953. (With a Summary in English.)

Adults of *Dichroplus maculipennis* (Blanch.), *D. elongatus* G.-T., *D. pratensis* Bruner and *D. conspersus* Bruner collected in the Provinces of Buenos Aires and Rio Negro, Argentina, were found to be infested internally by a fungus, and Acridids received from Vallenar, Chile, were attacked by the same organism. The microscopic characters of the yeast-like forms in the haemolymph and of the colonies that developed on various culture media are described. The fungus was found under widely differing climatic conditions and, as it was observed in the driest season of the year, it does not appear to be affected by low relative humidity. In the laboratory, various other Acridids, including *Schistocerca cancellata* (Serv.) were artificially infested by injection of haemolymph, as also were unspecified Lamellicorn larvae. A study of infested examples of *Dichroplus* showed that the vital organs were not attacked, the most serious consequences of infestation being the consumption of fat-reserves and the destruction of the lymphocytes; external symptoms were not apparent until a few days before death. The identity of the fungus is not known, but it is apparently not the species described as *Isaria stenobothri* from grasshoppers in Europe or that from *Melanoplus differentialis* (Thos.) in the United States referred to by Fitzgerald as *Phoma stenobothri* [*R.A.E.*, A **32** 388], which the authors consider to be distinct from each other.

VERGANI (A. R.). **Ácaros de interés económico para nuestros cultivos.** [Mites of economic Importance on Crops in Argentina.]—*Rev. Invest. agric.* **7** no. 3 pp. 213–252, 19 figs., 12 maps, 37 refs. Buenos Aires, 1953.

A brief account of the morphology of mites is followed by a systematic list of the species that are pests of crops in Argentina, with notes on their distribution, which is also shown on maps, the damage caused, and in some cases bionomics. They comprise *Eriophyes pyri* (Pgst.), which causes blisters on the leaves of pears and sometimes apple and also deformation of the fruits; *E. vitis* (Pgst.), which causes erinosis of the leaves of vines [*cf. R.A.E.*, A **39** 447], but is of no great importance; *Aceria* (*E.*) *erinea* (Nal.), which causes erinosis on the leaves of walnut; *Phyllocoptruta oleivora* (Ashm.), which attacks the twigs, leaves and fruits of *Citrus*; *Epitrimerus pyri* (Nal.), which causes bronzing of the leaves and lesions on the fruits of pear and was found in Argentina for the first time in 1947; *Rhizoglyphus echinopus* (Fum. & Rob.) (*hyacinthi* Banks), which infests bulbs, tubers and roots; *Bryobia praetiosa* Koch, which attacks the leaves of apple and pear; *Tetranychus telarius* (L.), which is polyphagous; *Anychus schultzi* Blanch., which infests castor (*Ricinus communis*) [**32** 340]; *Eutetranychus banksi* (McG.) (*Anychus verganii* (Blanch.)), which infests the leaves of *Citrus*; *Metatetranychus ulmi*

(Koch) (*Paratetranychus pilosus* (C. & F.)), which attacks numerous plants and has been observed in Mendoza on peach; and *Brevipalpus inornatus* (Banks) (*Tenuipalpus pseudocuneatus* Blanch.), which causes the affection of oranges known as lepra explosiva [*cf.* **34** 298] and has also been observed on other plants including vines.

BARNES (D.). **Biología, ecología y distribución de las chicharritas,** *Dalbulus elimatus* **(Ball) y** *Dalbulus maidis* **(DeL. & W.).**—*Foll. téc. Ofic. Estud. esp. Secret. Agric. Méx.* no. 11, 112 pp., 2 pls., 29 figs. (2 fldg.), 1 fldg. table, 34 refs. Mexico, D.F., 1954. (With a Summary in English.)

A detailed account is given of investigations carried out in Mexico in 1950–52 on the Cicadellids, *Dalbulus elimatus* (Ball) and *D. maidis* (DeL. & Wolc.), which transmit the virus that causes maize stunt there [*cf. R.A.E.*, A **42** 267]. This disease occurs throughout Mexico, though sometimes only locally, and its incidence is relatively low. The distribution of the two vectors is shown on maps, and the climate and vegetation of the areas in which they were taken are described in detail. Their distribution in other countries is discussed, largely from the literature, and descriptions are given of the nymphs of both species, which can be differentiated easily only in the fourth and fifth instars. *D. maidis* occurred up to heights of about 6,500 ft. and was the more numerous up to about 2,450 ft., but *D. elimatus* predominated above this and was thus the more important species in the highlands of central Mexico, where cereals are largely grown.

Laboratory observations showed that the females of both species oviposited only after pairing had taken place and usually laid their eggs singly along the central veins of the maize leaves. Observations on *D. elimatus* at Chapingo on maize in the summer of 1951 and on maize and wheat in the winter of 1951–52 showed that the egg stage lasted 23 and 36–38 days, respectively. In July–August, the nymphal stage on maize averaged 32·7 days for *D. elimatus* and 32·4 for *D. maidis*. Studies on the duration of the nymphal stage in the dry winter months were made by transferring nymphs to maize and wheat in an unheated greenhouse (where the temperature averaged 17°C. [62·6°F.] and the relative humidity at least 55–60 per cent.), in the laboratory (at 19·6°C. [67·28°F.]) and in an open-air insectary (where the temperatures averaged 12·8°C. [55·04°F.] and the relative humidity 25 per cent., these conditions much resembling those recorded in the field). Under these three sets of conditions, respectively, it lasted 35·5, 36 and 60 days on maize and 37·9, 35·6 and 59·4 days on wheat for *D. elimatus*, and 36·8, 35·5 and 55·2 days on maize for *D. maidis*; young nymphs of the latter did not complete their development on wheat in the insectary, but the nymphal stage lasted 35·6 and 38·5 days on this plant in the greenhouse and laboratory. There was a preoviposition period of 1–7 days for *D. maidis* and 4–5 days for *D. elimatus*, and the females laid up to six eggs per day; 63·3 and 80·5 per cent. of the eggs hatched, respectively. In the greenhouse, the adults survived for about a month on maize; on wheat, *D. elimatus* survived for 2–3 weeks, but *D. maidis* died within a few days.

In investigations on alternative food-plants, *D. elimatus* oviposited on wheat and barley, the eggs being laid in the stems, but these were less attractive than maize. *D. maidis* oviposited on neither of these. In central Mexico, maize is cultivated only in the rainy months of June–September. Small grains, particularly wheat, are grown in the winter, though wheat is not usually sown until between mid-November and late December and is harvested in March–April. In spring and autumn, when neither maize nor

wheat is available, *D. elimatus* was observed on various wild and cultivated plants, but the only ones on which development from egg to adult was completed in the greenhouse and insectary were *Bromus inermis*, which is cultivated on a very small scale, and the wild *B. laciniatus* and *Euchlaena mexicana* (teosinte). Only small numbers of these plants are available during the winter. *D. elimatus* oviposited and the nymphs hatched, but did not develop, on various other wild grasses, and the adults fed but did not oviposit on lucerne, beans, broad beans (*Vicia faba*), potato, carrot, vetch (*V. sativa*), *Crotalaria* sp., *Medicago hispida* and *Melilotus officinalis* and survived on them for 2–3 days. *D. maidis* oviposited only on maize and *Euchlaena mexicana*.

Investigations on seasonal abundance showed that populations of *D. elimatus* were high at the time the maize was harvested, but that numbers then declined rapidly in the absence of suitable food-plants. Wheat was available from December, but since *D. elimatus* requires about 100 days to complete its life-cycle on this crop in winter, only one generation had developed on it by the time it was harvested. Populations were then again reduced until maize became available in late May. As *D. elimatus* required about 60 days to complete its life-cycle in summer, only two generations developed on maize; large numbers of nymphs died when their food-plants were removed at harvest, and many that survived were killed by the frosts that followed. *D. maidis* was not abundant at any time, and numbers were particularly low in February–September. Nymphs and adults of both species were parasitised by Dryinids, but the percentage parasitism was at no time high. It was observed that heavy rains destroyed large numbers of young nymphs on maize.

LEJEUNE (R. R.) & HILDAHL (V.). **A Survey of Parasites of the Larch Sawfly (*Pristiphora erichsonii* (Hartig)) in Manitoba and Saskatchewan.** —*Canad. Ent.* **86** no. 8 pp. 337–345, 6 refs. Ottawa, 1954.

The current outbreak of *Pristiphora erichsonii* (Htg.) on larch in Canada [*cf. R.A.E.*, A **37** 441] now extends over nearly the whole of Manitoba and Saskatchewan, north-western Ontario and part of north-eastern Alberta, and infestation has spread to northern Minnesota [*cf.* **42** 155], in the United States. Annual surveys of the parasites that attack this sawfly, based on dissections of the overwintering larvae in cocoon samples collected from the soil at places in Manitoba and Saskatchewan, were begun in 1944, and an account is given of the results, some of which have already been noticed [**39** 435]. The principal parasites found were the Tachinid, *Ptychomyia selecta* (Mg.) (*Bessa harveyi* (Tns.)), the Ichneumonid, *Mesoleius aulicus* (Grav.) (*tenthredinis* Morl.) and the Pteromalid, *Tritneptis klugii* (Ratz.), but occasional examples of seven other Hymenoptera and two Diptera were also obtained.

Parasitism by *P. selecta* varied from 0 to 59 per cent. in the different localities and years [*cf.* **39** 435] and was evidently of importance in controlling the outbreak at five places in Manitoba, though it was consistently very low at another place only 13 miles from one of them. It usually reaches a maximum 3–5 years after infestation has reached its peak, and then remains fairly high even though host numbers are declining. Up to 52 per cent. of the host larvae were found to contain eggs or larvae of *M. aulicus*, but very few of the eggs hatched, owing to the immunity reaction of the host [*cf.* **43** 133], and effective parasitism rarely exceeded 5 per cent. The numbers of host larvae exhibiting this reaction varied from year to year and place to place, but showed no discernible trend. J. A. Muldrew found

that when host larvae containing eggs of *M. aulicus* were reared at temperatures between 48 and 85°F., hatching was most frequent at the lower temperatures, and also that it was more frequent in unhealthy than in healthy larvae. The immunity reaction seems to have developed rapidly in the Prairie Provinces. Effective parasitism was as high as 88 per cent. in Manitoba in 1927 [**16** 450], but immunity had become common by 1940. *T. klugii* caused 7·5 per cent. parasitism at one place in Manitoba in 1941 and 1·5 at another in 1942, was not recovered at all during 1943–48, and subsequently attacked up to 5·6 per cent. of the larvae; isolated parasitism percentages of 16·7 and 23·4 in Saskatchewan and 27·5 in Manitoba may have been produced accidentally during storage. This species was liberated at four places in 1948, 1949 and 1952, but it was subsequently recovered from only one of them.

Pristiphora erichsonii has virtually disappeared from British Columbia, where the immunity reaction to *M. aulicus* is only slightly developed, and it is suspected that the persistent infestation in central Canada and Minnesota has resulted from the spread of a strain of it that is resistant to this parasite.

Green (G. W.). **The Functions of the Eyes and Antennae in the Orientation of Adults of** *Neodiprion lecontei* **(Fitch).**—*Canad. Ent.* **86** no. 8 pp. 371–376, 3 figs., 2 refs. Ottawa, 1954.

An account is given of experiments to determine the importance of the compound eyes, dorsal ocelli and antennae in the orientation of adults of *Neodiprion lecontei* (Fitch). It is concluded that adults with at least one type of eye functioning orientate to the polarisation pattern of the overhead sky and that their paths may also be influenced by body temperature and stimulation of the antennae by wind. Blinded adults respond to the sun as a source of radiant heat, at least when their body temperature reaches photic reversal levels [*cf. R.A.E.*, A **44** 111], and this has also been observed in other insects. It is possible that normal insects may respond primarily to this stimulus at high temperatures and that, at least in some species, this response may reduce or replace the usual response to sudden shifts in the polarisation pattern of the overhead sky.

Milne (A.) & Laughlin (R.). **Biology and Ecology of the Garden Chafer,** *Phyllopertha horticola* **(L.). I. The Adult and Egg Production.**—*Bull. ent. Res.* **47** pt. 1 pp. 7–22, 2 figs., 4 refs. London, 1956.

Milne (A.). **II. The Cycle from Egg to Adult in the Field.**—*T. c.* pp. 23–42, 2 figs., 7 refs.

The most injurious Lamellicorn in Britain is *Anomala* (*Phyllopertha*) *horticola* (L.), which causes severe but sporadic damage to pasture as a larva and to fruit trees as an adult in southern and south-western England, the Lake District, western Scotland and Wales [*cf. R.A.E.*, A **33** 155; **35** 165; **40** 71]. A long-term study of its bionomics and ecology was begun in the Lake District in late 1947, and the first of these papers contains an account of laboratory studies on adult life and egg production. The following is based on the authors' summary of the results. Adult feeding affects neither the number of eggs produced in the ovaries, which depends entirely on the amount of fat stored in the fat-body by the third-instar larvae before diapause, nor the number laid. Both males and females survived for 3–35 days with food and a day or two less without. About

14 per cent. of the females died during the preoviposition period. The fat-body of the females was exhausted and all the eggs had been matured about half way through adult life; oviposition and feeding apparently do not begin until egg production is complete. The oviposition period lasted 1–23 days, with an average of 5–6, and was rather shorter when the females were deprived of food. Death occurred up to ten days after oviposition was complete. Some unfertilised females oviposited just before dying, the eggs being non-viable. Fertilised females laid an average of 13 eggs each, with a maximum of 46, and over 70 per cent. laid all or nearly all their eggs. There was no significant difference in the survival period of females that deposited all or only some of their eggs. Females were larger than males and about 1·3 times as heavy. The number of eggs produced per female and the number laid were positively correlated with body weight, which is proportional to weight of fat-body. Body weight was not associated with failure to oviposit. The number of eggs laid at a time and the intervals between ovipositions by a single female are apparently quite random. Each oviposition takes place at a different site in the soil, and in each case the eggs are deposited singly in small cavities about ¼ in. apart situated within an inch of the vertical line passing through the entrance to the oviposition burrow. They hatched in 4–6 weeks at 15–17°C. [59–62·6°F.], and 72–96 per cent. of the eggs were viable, the proportion of unfertilised eggs deposited increasing with the age of the female.

The following is based on the author's summary of the second paper, which comprises an account of field investigations on the development of *A. horticola* in 1948–52. Oviposition began not earlier than the latter half of May. In soil 3½ ins. deep, eggs were laid at an average depth of 1½ ins. [*cf.* **35** 165]. The egg stage and the first and second larval instars averaged five, about three, and about four weeks, respectively, and the third larval instar averaged 8–10 weeks up to the beginning of diapause. Larvae in the three instars first appeared about the first and fourth weeks in July and the fourth week in August, respectively. Diapause began about the third week in October, and, except for a few stragglers present in early December, the entire population was in diapause by the end of November. Grass roots comprise the chief food of the larvae, and dead invertebrates encountered by chance are probably also eaten. Growth takes place during the first and second instars, and the fat-body, which has to provide nourishment for the rest of development and for the production of eggs or spermatozoa, is built up during the third. The larvae feed at depths of ¾–2½ ins. on hatching, but ascend, probably to obtain a more copious food supply, as they grow and are at depths of ¼–1 in. in the third instar. With the possible exception of a very prolonged drought, weather had no effect on the level at which feeding took place. In soil 2·3–6 ins. deep, they overwintered at depths of 0·8–3·8 ins. Prepupae were present at about the end of March, and the prepupal stage lasted 3–4 weeks. Pupation, which takes place within the split larval skin in the cell in which winter was passed, begins in the third week of April, and the pupal stage lasted about four weeks. The ratio of males to females among pupae was 1·13–1·89 : 1. On emerging, the adult at first remains in the cell and does not appear at the surface until some 6–8·5 days later. Active adults were first seen as early as the third week in May and as late as the second week in June, but usually in the last week in May. Males first emerge at the surface a day earlier than females. There was considerable overlap, ranging from 8 to 41 days, in the developmental stages present in a population, though more than two are never present at a time. This is caused by variations in the temperature of the soil and by diapause. The minimum overlap occurs as maturity is approached, so that pairing is facilitated.

Banks (C. J.). **The Distributions of Coccinellid Egg Batches and Larvae in Relation to Numbers of** *Aphis fabae* **Scop. on** *Vicia faba*.—*Bull. ent. Res.* **47** pt. 1 pp. 47–56, 9 refs. London, 1956.

The following is largely the author's summary. Further analyses of results obtained from a study of populations of Coccinellids (mainly *Adalia bipunctata* (L.)) on three plots of beans (*Vicia faba*) infested with *Aphis fabae* Scop. at Rothamsted during 1952 [*cf. R.A.E.*, A **44** 1] are presented. The degree of correlation between numbers of Coccinellid egg batches and Aphids on the plots (as indicated by regression analysis) varied inversely with the size of the Aphid populations on the plots. It was negligible on one in which Aphids were extremely numerous and most marked on the one in which Aphid numbers were lowest. The degree of correlation between egg batches and Aphids was determined apparently by the rate of increase of Aphid numbers. It is pointed out that while these Coccinellid populations increased additively (by immigration of adults to the beans), populations of *A. fabae* increased multiplicatively (by reproduction) and at much higher rates.

During the early stages of the Aphid infestation on the bean plots, when Aphid-infested stems were comparatively few, there was no statistically significant association between Coccinellid eggs and the presence of Aphids on the bean stems, but when all stems had become infested, egg batches tended to occur most frequently on the stems with the most Aphids. From these observations and general field experience it is concluded that female Coccinellids do not need the stimulus of the presence of Aphids before laying their eggs on beans and that they concentrate on well-infested bean stems, tending to stay and feed on the Aphids and probably ovipositing on those stems. The distributions of Coccinellid larvae in the third and fourth instars indicate that they, too, tend to concentrate on well-infested stems. When few stems are infested by Aphids, many young Coccinellid larvae probably die of starvation before finding them, unless they can survive temporarily on other food; those able to find a small amount of such food quickly would probably survive longer and be able to search more plants for a food supply adequate for growth. More young larvae can probably reach an Aphid colony when infestation is well advanced than when it is in its early stages.

Hussey (N. W.). **A new Species of** *Megastigmus* **(Hym.: Chalcidoidea) from British Somaliland.**—*Bull. ent. Res.* **47** pt. 1 pp. 57–59, 1 fig., 4 refs. London, 1956.

A description is given of the adults of both sexes of *Megastigmus somaliensis*, sp. n., a Torymid that infests the seeds of *Juniperus procera* and hinders natural regeneration of this tree in the Daloh Forest, British Somaliland. Two specimens in the British Museum, collected on giant juniper at about 9,000 ft. in Ethiopia, appear to belong to this species. An unidentified species of *Bracon* was also reared from the infested seed. Notes on species of *Megastigmus* recorded from juniper in Europe [*cf. R.A.E.*, A **36** 267] are included.

Eady (R. D.). **Two new Species of the Genus** *Paranastatus* **Masi (Hym. Eupelmidae) from Fiji.**—*Bull. ent. Res.* **47** pt. 1 pp. 61–67, 12 figs., 1 ref. London, 1956.

Paranastatus nigriscutellatus and *P. verticalis*, spp. n., are described from adults of both sexes, reared from eggs of the Phasmid, *Graeffea crouanii* (Le Guillou), on coconut in Fiji. Keys are given to the females of the four known species of *Paranastatus* and to the males of three of them.

Pollard (D. G.). **The Identity of the Cotton Flea Beetle of the Sudan (*Podagrica* spp., Coleoptera: Halticinae).**—*Ann. Mag. nat. Hist.* (12) **8** no. 93 pp. 713–717, 3 figs., 17 refs. London, 1955. **Halticinae of the Sudan.**—*Bull. ent. Res.* **47** pt. 1 pp. 73–87, 7 maps, 11 refs. London, 1956.

It is shown in the first of these two papers that the common flea-beetle on cotton in the Sudan, which has for many years been identified as *Podagrica puncticollis* Weise [*cf. R.A.E.*, A **19** 396; **39** 212], comprises, in the main cotton-growing areas, a mixture of two species, *P. puncticollis* and *P. pallida* (Jacoby). It was earlier misidentified as *P.* (*Nisotra*) *uniformis* (Jacoby) [*cf.* **8** 172; **18** 634; also **43** 444], a species that occurs in West Africa [**13** 554; **14** 7], where it infests cotton, but is absent from the Sudan. Characters differentiating the three species are described.

In the second paper, an alphabetical list is given of the 39 Halticids known from the Sudan, with locality records, notes on the food-plants of most of them and an indication of the economic status of most of the 21 recorded on crop plants. The only major pests are *P. puncticollis* and *P. pallida* on cotton and *Phyllotreta cheiranthi* Weise [*cf.* **30** 213] on cruciferous crops, especially seedlings. The paper also includes maps showing the distribution of the 19 genera represented, a systematic list of food-plants with the Halticids that attack each, and a key for the separation of the adults of all but two of the species, for which specimens were not available.

Bradley (J. D.). **A new Genus for *Tortrix postvittana* (Walker) and certain other Australian and New Zealand Species (Lepidoptera: Tortricidae).**—*Bull. ent. Res.* **47** pt. 1 pp. 101–105, 2 pls., 2 figs., 2 refs. London, 1956.

Austrotortrix, gen. n., is erected for *Tortrix postvittana* (Wlk.) (the type), and nine other species from Australia and one from New Zealand are referred to it. Synonyms and type localities are shown for each species, and the genitalia of both sexes of *A. postvittana* are described. This Tortricid is a common pest of apple and *Citrus* in Tasmania and coastal regions of Australia. It also occurs in New Zealand and Hawaii, where it was probably accidentally introduced, and a small colony has existed at Newquay, in south-western England, for about 20 years.

Cornwell (P. B.). **Some Aspects of Mealybug Behaviour in Relation to the Efficiency of Measures for the Control of Virus Diseases of Cacao in the Gold Coast.**—*Bull. ent. Res.* **47** pt. 1 pp. 137–166, 1 pl., 15 graphs, 14 refs. London, 1956.

In the Gold Coast, cacao trees infected with swollen-shoot virus are felled, and, since 1948, the slash has been stacked in conical piles surrounded by the trunks and larger branches and the area round the piles cleared of vegetation for a distance of about four paces. The investigations described were carried out to determine the behaviour of *Pseudococcus njalensis* Laing, the main vector of the virus, in the piles of slash [*cf.* R.A.E., A **43** 80], and the following is based on the author's summary of the results. Initial populations of *P. njalensis* in piles of infected slash are usually small, possibly owing to a reduced water content in the tissues of the infected trees, which causes many of the mealybugs to leave them at an early stage of the infection. Piling reduces the rate of wilting of the cut wood and, in consequence, the rate of mealybug migration from the piles,

and protects the mealybugs from direct insolation and rainfall, thus enabling populations to persist on the cut wood. Colonies survive longest in the lower parts of the piles, where desiccation of the plant material is most delayed. Mealybugs continue to live and reproduce in the heaps for as long as nine weeks or more. Reproduction is stimulated as the felled tissues wilt, and the resulting first-instar nymphs contribute largely to such migration as occurs. No increase in populations of predacious Coccinellid or Cecidomyiid larvae occurs within the piles as a result of the concentration of mealybugs within them.

The mealybugs are capable of crawling quite rapidly for long distances over smooth surfaces, but become incapable of movement when starved for a few days, and most then die within a week. A soil surface seriously impedes the progress of mealybugs, especially nymphs, leaving the slash heaps. Even on bare soil, movement is slow, and few, if any, infected individuals can travel an appreciable distance in the period for which the virus persists within them. These field results were confirmed in the laboratory by the use of mealybugs labelled with radioactive phosphorus [*cf. loc. cit.*]. Ants, mainly *Crematogaster* and *Oecophylla*, become associated with the slash piles and transport a few of the mealybugs, but the number affected is very small and migrating mealybugs do not readily become established on seedlings or mature cacao, even in the presence of their attendant ants.

Infected slash piles are thus very unlikely to serve as a source of infection for healthy trees, and there is no evidence that the effectiveness of control by cutting out infected cacao is seriously affected by their presence. Without the co-operation of growers in supporting the removal of trees having only latent infection, no further recommendations can be made to improve the present practice.

CHEEMA (P. S.). **Studies on the Bionomics of the Case-bearing Clothes Moth,** *Tinea pellionella* **(L.).**—*Bull. ent. Res.* **47** pt. 1 pp. 167–182, 1 pl., 2 graphs, 20 refs. London, 1956.

Tinea pellionella (L.) is an important pest of woollen textiles in India, and the following is based on the author's summary of this account of laboratory investigations on its bionomics. The egg stage lasted 4–5, 5, 6–7 and 6–7 days at 21·5, 25, 30 and 32·5°C. [70·7, 77, 86 and 90·5°F.], respectively, and was unaffected by relative humidity. Temperatures above 32·5°C. were lethal, and the percentage of eggs that hatched was greater at low than at high temperatures. The development of the larvae and the number of instars were influenced by both temperature and relative humidity, high humidities favouring rapid development, irrespective of temperature. The larval stage was shortest (consisting of five instars occupying about 33 days) at 25°C. and 90 per cent. relative humidity, and longest (12 instars occupying 97 days) at 30°C. and 30 per cent. relative humidity. Woollen materials impregnated with yeast favoured larval development more than untreated materials. No colour preference was shown, but newly hatched larvae failed to develop on woollen fabrics dyed with an orange dye, even when impregnated with yeast. Larvae of all ages emerged from their cases when exposed to direct sunlight, irrespective of temperature and humidity, and died in a few minutes at temperatures of 39–45°C. [102·2–113°F.]; survival was possible at 32°C. [89·6°F.]. Under experimental conditions, the amount of damage to cloth was significantly greater when the larvae were reared in continuous darkness than in alternating light and darkness, and at 90 per cent. relative humidity than

at 30 per cent., but it did not differ significantly at 90 per cent. relative humidity and 32·5 or 27·5°C. [81·5°F.]. The prepupal stage lasted 4·4 days at 26·5°C. [79·7°F.] and 70 per cent. relative humidity, and the pupal stage 18, 10·3 and 10·3 days at 21·5, 25 and 30°C., respectively, and 90 per cent. relative humidity, a reduction in humidity having little if any effect. At 22°C. [71·6°F.] and 26·5°C., the preoviposition period lasted 3·5 and 1·4 days, respectively, oviposition continued for about four days, and the females died one day later; the mean numbers of eggs laid per female were 37 and 48, respectively. The numbers laid per female in a culture kept at 28·5°C. [83·3°F.] and 85 per cent. relative humidity were 8–83 and showed a highly significant relation with the weight of the female at emergence; there was no correlation between this last factor and the survival period of the female. Males survived for about four and females for about six days. The ratio of males to females was 1:2·6, and at 26°C. [78·8°F.] and 82 per cent. relative humidity, 3–4 generations were produced during the year.

Puttarudriah (M.) & Channa Basavanna (G. P.). **A Study on the Identity of *Bracon hebetor* Say and *Bracon brevicornis* Wesmael (Hymenoptera: Braconidae).**—*Bull. ent. Res.* **47** pt. 1 pp. 183–191, 22 refs. London, 1956.

The following is based almost entirely on the authors' summary. From a review of the literature, mainly Indian, relating to the taxonomy and hosts of *Bracon hebetor* Say and *B. brevicornis* Wesm., it appeared that these two species may not be distinct. Studies were accordingly made of the morphological characters, including the genitalia, that have been used in establishing their identity [*R.A.E.*, A **39** 27], during which a large number of specimens of *B. hebetor*, obtained by rearing on *Corcyra cephalonica* (Stnt.), *Ephestia cautella* (Wlk.) and *Adisura atkinsoni* Moore and by collecting in food-grain godowns at Bangalore, and of *B. brevicornis*, of which most were reared on *C. cephalonica* and *E. cautella* in Bangalore, *Nephantis serinopa* Meyr. at Coimbatore or *Pyrausta nubilalis* (Hb.) in the United States and some were received from New Delhi and Canada, were examined. It was found that differences in colour, relative proportions of antennal joints, and punctation on the abdomen were variable and unreliable as differentiating characters. The number of antennal joints, which was hitherto considered diagnostic, is also unreliable, as there is wide variation even in the progeny of a single pair of parents [*cf. loc. cit.*]. In cross-breeding experiments with Indian material, the offspring of reciprocal crosses were fertile, both when inbred and when crossed with the pure parent strains, and also showed fairly wide variation in the number of antennal joints. It is concluded that only one species, *B. hebetor*, exists in India, but a comparative study of a large number of specimens from Europe and other countries, as well as cross-breeding tests with them, will be required before it can be known whether *B. brevicornis* is a synonym of it.

Nirula (K. K.), Antony (J.), Sahasranaman (K. N.) & Menon (K. P. V.). **A new pupal Parasite of *Nephantis serinopa* Meyr.**—*Indian Cocon. J.* **8** no. 2 repr. 4 pp., 1 fig., 4 refs. Ernakulam, 1955.

Since 1954, an Ichneumonid identified as *Goryphus* sp. near *G. nursei* (Cam.) has been observed parasitising the pupae of *Nephantis serinopa*

Meyr. on coconut in the coastal areas of central Travancore. The adults are briefly described. An egg is laid on or close to the prepupa within the cocoon and hatches in two days. After feeding within the host for 4–5 days, the larva emerges and pupates in a cocoon attached to that of the host and to the leaf. Development was completed in 12–16 days and adults survived for more than a month in the laboratory when honey solution was provided. Only one parasite completes its development in each host. In 1954–55, parasitism by *Goryphus* ranged up to 6 per cent. and was observed only in July–December, when the relative humidity was high and the temperature moderate. The parasite is thought to be unsuitable for mass rearing in the laboratory in view of its solitary breeding habits. A list showing the other parasites of *N. serinopa* in India [*cf. R.A.E.*, A **29** 620; **43** 231] is included.

Stofberg (F. J.). **Ant Control in *Citrus* Orchards.**—*Fmg in S. Afr.* **29** no. 344 pp. 529–531. Pretoria, 1954.

In 1952–54, organic insecticides were tested in South Africa for the control of *Pheidole megacephala* (F.) in *Citrus* orchards, where this ant is a considerable pest, particularly in the eastern Transvaal, because of its association with Coccids and other honeydew-producing insects. In a preliminary test, on 17th March 1952, a garden syringe was used to apply sprays in a band 1½–2 ft. wide round the trunks of orange trees. Dieldrin was applied at 2·8 and 1·4 lb. per 100 gals. in emulsion sprays and at 3 and 1·5 lb. in wettable-powder sprays, and chlordane at 2 lb. in both wettable-powder and emulsion sprays. Two days later, all the treated trees were free from ants, and thousands were found dead on the ground. Dieldrin at all concentrations remained effective for eight weeks, whereas chlordane lost its effectiveness after 5–6 weeks. The trees were sprayed again on 21st May, after which all those treated with dieldrin remained free from ants for 14 weeks and those treated with chlordane for 9–10 weeks. On 10th September, the treatments were repeated on some of the trees, and dieldrin then kept the trees free from infestation until 20th March, whereas trees treated with chlordane became reinfested after only three weeks. Activity remained normal on untreated trees throughout.

A second test was begun on 26th May 1952, when young orange trees were treated in the same way with emulsion sprays containing 1·5 and 0·75 per cent. dieldrin and 1·5 per cent. chlordane and a wettable-powder spray containing 1·5 per cent. dieldrin; the dieldrin sprays remained effective for almost 11 months, but chlordane permitted reinfestation within five months.

In a third test, in which sprays were applied to young orange trees in May 1953, protection was afforded for 8 and 7 months by 2 per cent. DDT in emulsion and wettable-powder sprays, respectively, 5 months by 1 per cent. DDT in wettable-powder or emulsion sprays, 4 months by 1·5 per cent. chlordane in an emulsion spray and 12 months by 1·5 per cent. endrin in an emulsion spray. During the sixth month after treatment, 5 per cent. of the trees treated with endrin were infested, but the ants disappeared in the following month. Trees treated with 1·5 per cent. dieldrin were still uninfested after 14 months. Dieldrin and endrin at 1·5 per cent. and DDT and chlordane at 2 per cent. are recommended, applications of the two latter products being repeated after 6–7 months. The best results should be obtained if treatment is applied in spring, after the crop has been picked and before warmer weather leads to an increase in ant activity.

Tapley (R. G.). **Insecticidal Lacquers and White Coffee-borer Control.**—*E. Afr. agric. J.* **20** no. 3 pp. 145–148, 2 refs. Nairobi, 1955.

Although tests in Tanganyika had shown that the application of insecticides, in particular dieldrin, to the stems of coffee trees immediately before emergence of the adults of the white coffee borer [*Anthores leuconotus* Pasc.] gave good control of this Lamiid, investigations were hindered by lack of a formulation that would retain an insecticide on the surface of absorbent bark for long periods and in spite of rain. In 1953, tests were begun with insecticides incorporated into a urea-formaldehyde resin [*cf. R.A.E.*, A **43** 255]. Lacquers were prepared by mixing 4 parts DDT, 2 parts dieldrin or aldrin or 1 part γ BHC with 25 parts of the base, by weight, and a white pigment was added to facilitate observation. No damage was caused to the trees when the lacquers were applied with a paint sprayer, although a mixture of sulphuric acid and butanol was added as an accelerator just before application. Treatments were applied on 10th March and 16th December to stems that had been cleaned to a height of about 18 ins. from the ground, adults were confined on the treated stems for 48 hours, fresh foliage being provided in the cages, and mortality was recorded after a further 48 hours on untreated stems and leaves. Both DDT and dieldrin gave high mortality of adult females a few days and also, in the case of the trees first treated, eight months after application. BHC was very effective when first applied but not after eight months, and aldrin gave poor and erratic kill at both times. Lacquer without an insecticide caused no mortality. The insecticides had little effect on oviposition, and almost all the eggs laid hatched normally. As the larvae bore beneath the bark for about three months before entering the wood [*cf.* **28** 144–145], the trees were examined for living larvae in March 1954. On dieldrin-treated trees, the galleries in the bark were very short, the larvae having died in the early stages, apparently as a result of the small amount of the dieldrin coating that penetrated the bark. Mortality of the larvae in the other treated trees appeared to be due partly to the insecticides, but the galleries were bigger than in the dieldrin-treated trees.

Swaine (G.), Evans (A. C.) & Ward (J. B.). **The Cotton Red Bollworm Problem in southern Tanganyika.**—*E. Afr. agric. J.* **20** no. 3 pp. 183–188, 4 figs., 2 maps, 6 refs. Nairobi, 1955.

The cultivation of cotton was extended to the north in Mozambique during the late war, and *Diparopsis castanea* Hmps., which is present there, was found in 1946 and 1947 in the Southern Province of Tanganyika in an area near the border with that country. To prevent further northward spread of this bollworm to the cotton-growing areas of the Eastern Province of Tanganyika, where it does not as yet occur, a quarantine belt about 140 miles wide was established in 1947. In 1951, permission was given for trial plantings of cotton at Nachingwea, just within the southern limit of the quarantine belt and about 90 miles from the Mozambique border, and investigations showed that the nearest cotton infested by *D. castanea* was some 48 miles away to the south, at Chiungutwa. However, in 1952, a few larvae were found on the cotton at Nachingwea and the evidence indicated that they had originated from the population at Chiungutwa, the dry season having been passed by the pupae in diapause in the soil. In 1953, one larva was found at Nachingwea, in one of the areas in which the insect had been observed in 1952, and in 1954, larvae were found early in the season and were present by mid-June in almost all the cotton areas at Nachingwea. It was decided that further cultivation of cotton would merely result in larger populations

of *D. castanea*, and that the plantings should be discontinued. In April–July, when the cotton would normally be susceptible to infestation, the prevailing winds are from the south and would thus facilitate the spread of infestation. A dust containing 10 per cent. DDT and 3 per cent. γ BHC applied weekly at 16 lb. per acre did not control the bollworm at Nachingwea. The diapause behaviour of the pupae was characteristic [*cf. R.A.E.*, A **34** 332], 65 per cent. of those collected in late April giving rise to adults in late May, 7 per cent. of those collected on 16th May doing so in mid-June, and all those collected on 30th June remaining in diapause.

Four larvae of *D. gossypioides* Clements [*cf.* **40** 67] were taken on the wild *Gossypioides kirkii* near Nachingwea in 1954, but *D. castanea* was not observed on it, though this species was present on cultivated cotton only ten miles away. Adult emergence of *D. castanea* at Nachingwea apparently began at the end of February or in early March, but bolls were not produced on *G. kirkii* until the end of May, and it is therefore concluded that *G. kirkii* is not a normal food-plant of *D. castanea*.

D. gossypioides is present in the Eastern Province, and as it survives the dry season there, as in the Southern Province, as a pupa in long-term diapause, it is assumed that *D. castanea*, if introduced, would do the same, so that maintenance of the quarantine belt is still necessary. Characters are given differentiating the larvae of the two species, and their recorded distribution in the areas concerned is shown on maps.

Backlund (H. O.). **Small Patches with permanent Red Locust Population in northern Tanganyika Territory.**—*E. Afr. agric. J.* **20** no. 3 pp. 202–204, 2 figs., 2 refs. Nairobi, 1955.

During the outbreak of 1927–45, the range of *Nomadacris septemfasciata* (Serv.) included the whole of Tanganyika, and individuals considered by A. P. G. Michelmore to be in the solitary phase were found by him in 1935–36 to be generally distributed in open grasslands with tussocks of grass at least 1 ft. high, where stragglers from swarms also frequently occurred. At the time of writing, solitary individuals were rare in Tanganyika, except in Rukwa, in the south-west, and Malagarasi and Wembere, in the north. In 1951, M. C. Mossop recorded a restricted population of *N. septemfasciata*, apparently in the solitary phase, in patches of mixed vegetation including many species of tall and short grasses situated close to irrigation channels at a place in Southern Rhodesia, and in this paper the author describes habitats at several places in Shinyanga and Maswa districts, in the Lake Province of Tanganyika, that have some characters in common with the one in Southern Rhodesia and that support small, dense populations of *N. septemfasciata*. They are associated with irrigation systems, a semi-permanent watercourse, or relatively high water-tables, and comprise non-uniform and not particularly dense stands of dominant or semi-dominant *Phragmites*, almost invariably interspersed with *Hyparrhenia*; the undergrowth consists of *Cynodon dactylon* and other plants, and green grass is present throughout the year. These patches of tall grasses are not numerous; the surrounding plains are heavily overgrazed and do not support locust populations, even during outbreaks. In one irrigated area, about 650 × 110–240 yards in extent, the total population of *N. septemfasciata* was estimated in 1951 at 30. The locusts were concentrated in the tall vegetation and rarely flew more than 11–22 yards. E. Burtt stated that the population in one locality was permanent, and the author was informed locally that the hoppers live exclusively in the patches of vegetation; they were stated to feed on *Hyparrhenia* and not on *Phragmites*. The relation of these populations to the last outbreak is not

known, but the habitats all result from shifting cultivation and are therefore of fairly recent origin.

Fiedler (O. G. H.) & Du Toit (R.). **The Effect of Lindane Vapour on Stored Product Insects.**—*Onderstepoort J. vet. Res.* **26** no. 3 pp. 431–434, 8 fldg. tables, 3 refs. Pretoria, 1954.

The following is virtually the authors' summary. To assess the insecticidal effect of vapour originating from small quantities of lindane [almost pure γ BHC] at a temperature of 77°F., 12 series of experiments were conducted in which stored-product insects in closed fumigation chambers were subjected to the vapour from deposits at decreasing dosages (200–5 mg. per cu. ft.). The correctly measured quantity of insecticide evenly distributed on surfaces of equal size was achieved by impregnating sheets of paper with solutions of desired strengths. The insects tested were adults of *Tribolium confusum* Duv., *Calandra* (*Sitophilus*) *granaria* (L.), *Rhizopertha dominica* (F.) and *Acheta bimaculatus* (Deg.), and larvae of *Dermestes maculatus* Deg. (*vulpinus* F.) and *Tineola bisselliella* (Humm.).

The susceptibility of the different species varied considerably, but vapour originating from 5 mg. γ BHC in 1 cu. ft. of air was sufficiently toxic to produce complete kill or high mortality after several days of exposure. The period until death supervenes does not correspond with the dosage applied. The mortality rate is dependent rather on the length of exposure.

This principle is recommended for long-term protection of stored products and for the control of insect pests in enclosed spaces [*cf. R.A.E.*, A **44** 150].

Schrader (G.). **Chlorthion. Ein neues, wenig giftiges Insektizid aus der Reihe der Thiophosphorsäureester.** [Chlorthion. A new, little poisonous Insecticide of the Series of Thiophosphoric Acid Esters.]—*Angew. Chem.* **66** no. 10 pp. 265–267, refs. Weinheim, 1954.

The author outlines the process by which Chlorthion (O,O-dimethyl O-3-chloro-4-nitrophenyl thiophosphate) was synthesised in the laboratory, and its physical properties. It is closely related chemically to methyl-parathion, but is rather less toxic to insects than the latter, and very much less poisonous to mammals. It was far less toxic to rats ingesting it than methyl-parathion and caused no symptoms on cutaneous application to rats at 1 gm. per kg. body weight. Animals exposed for an hour to 1 oz. per 1,000 cu. ft. in a mist spray were mostly unharmed. Analogues of Chlorthion, including its ethyl homologue and O,O-dimethyl O-2-chloro-4-nitrophenyl thiophosphate, did not show such low mammalian toxicity.

Barnes (H. F.). **Gall Midges of economic Importance. Vol. VII. Gall Midges of Cereal Crops.**—8¾ × 5½ ins., 261 pp., 16 pls., 6 figs., 526 refs. London, Crosby Lockwood & Son, Ltd., 1956. Price £1 1*s*.

This volume is the seventh in the series [*cf. R.A.E.*, A **39** 141; **37** 400, etc.] and is devoted to the Cecidomyiids that attack cereal crops. The subject matter is arranged in four sections, dealing, respectively, with the species associated with wheat, barley, oats and rye, sorghums, *Panicum* millets (including species of *Echinochloa*, *Eleusine*, *Eragrostis*, *Panicum*, *Paspalum*, *Pennisetum* and *Setaria*), and rice. The information varies in scope and amount of detail with the species, but the topics dealt with usually include morphology, bionomics, distribution, alternative food-plants, damage, recognition of infestation, natural enemies, and control. For the more injurious species, information is also given on the assessment of damage and infestation and the influence of cultural operations on both,

the forecasting of outbreaks, the occurrence of biological strains, and variations in the susceptibility of cereals to attack. The author considers *Mayetiola secalis* Bollow, which was described from rye, wheat and barley in southern Germany, to be identical with *M. destructor* (Say), but treats *M. mimeuri* (Mesnil), which was recorded from these three cereals in Morocco and Algeria [**23** 145] and from barley in Italy [**42** 357], as provisionally distinct. He regards *Contarinia venturii* Vimmer [*cf.* **25** 213] as a synonym of *C. tritici* (Kby.), and proposes the name *Cecidomyia pennisetoides*, n., for *C. penniseti* Felt, which is preoccupied by *C.* (*Itonida*) *penniseti* (Felt) described in the same paper [**8** 473].

Melis (A.). **Il peso esercitato sul comportamento del** *Dacus oleae* **Gmel. dal fattore termico.** [The Influence of Temperature on the Behaviour of *D. oleae*.]—*Redia* **39** (1954) pp. 1–28, 6 graphs (3 fldg.), 1 fldg. table, 5 refs. Florence [1955]. (With a Summary in English.)

Investigations were continued in Tuscany in 1952–53 on the possibility that adults of *Dacus oleae* (Gmel.) that emerge from pupae formed in autumn survive long enough to infest young olives in late June [*cf. R.A.E.*, A **43** 135], with special reference to the effect of temperature. Climatic conditions during the period are compared with those prevailing during the earlier work. On 17th–22nd November, 4,400 larvae and 1,000 pupae were placed in 15 special emergence cages in the soil beneath olive trees, and 4,315 of the larvae entered the soil. Only six adults emerged, all from one cage and all between 18th December and 10th January. The exceptionally low percentage of emergence is attributed mainly to the very low temperatures in February and March, when the minimum often fell below freezing point, and a prolonged drought from mid-February to mid-April.

In the laboratory, conditions were made to approximate closely to those in the field, but temperatures were not quite so severe. Larvae were caged over sand, and the emergence percentages were 1·2 and 0·8, respectively, in two tests begun on 23rd November, the adults appearing in February, and 5·4 and 46·5 in two begun on 20th–23rd December, the adults appearing in April. The second of the last two cages was placed in the open on 5th March. When batches of 25 larvae or 25 pupae were placed on sand in glass containers about 3 ins. in diameter and 2 ins. deep under the same conditions on 20th November, the emergence percentages were 0–16, the adults emerging in February, and when similar batches were kept at 20°C. [68°F.], they were 44–80, the adults emerging in December. The fact that, in the first test, larvae that pupated in December gave rise to adults in April, two months later than did those that pupated in November, is considered to indicate that where pupation does not begin until mid-winter, adults may emerge late enough to survive until June. In contrast to preceding years, adults were taken in the field in early May in 1953.

In investigations on adult survival, individuals that emerged in September–October were kept in the laboratory at 20–22°C. [68–71·6°F.] and 80–85 per cent. relative humidity and provided with honey solution. Though many were dead by December, some did not die until June and two females survived until 4th and 13th July; it is concluded that survival for up to nine months may be possible in a favourable climate.

Detailed results are given of tests in which pupae of the first and second generations were reared at low temperatures resembling those prevailing in the field in winter. The emergence percentages resembled those observed for material caged in the field at that season, and it is concluded from the whole work that temperature is the chief factor regulating adult emergence of *D. oleae*.

Ciampolini (M.) & Beccari (F.). **Prove di lotta contro insetti dannosi al grano immagazzinato con prodotti insetticidi gassificabili.** [Tests on the Control of Insects attacking stored Grain with volatile Insecticides.] —*Redia* **39** (1954) pp. 29–36, 18 refs. Florence [1955]. (With a Summary in English.)

An account is given of tests carried out in Italy in 1952 with liquid fumigants for the control of adults of *Calandra granaria* (L.), *C. oryzae* (L.), *Rhizopertha dominica* (F.) and *Tribolium castaneum* (Hbst.) and larvae of *Plodia interpunctella* (Hb.) in stored wheat. The temperature in the laboratory was 26°C. [78·8°F.], and the relative humidity did not exceed 70 per cent. Measured amounts of about 18 lb. uninfested grain were put into narrow-necked flasks with a capacity of some 3 gals., and batches of about 50 insects were placed in cages at the bottom, in the middle (some 4 ins. from the bottom) and on the surface of the grain some days before treatment. After treatment, the flasks were kept sealed for 24 or 48 hours, at the expiry of which the insects were removed and observed for a further period of up to 13 days.

When the exposure was for 24 hours, carbon bisulphide at 48 oz. per 1,000 cu. ft. gave complete kill of all four species within the exposure period, a product containing 70·3 per cent. ethylene dichloride and 29·7 per cent. carbon tetrachloride at 60 oz. ultimately gave complete kill of all but the *Plodia* larvae, for which the final mortality was 87·8 per cent., a product containing 66·7 per cent. ethylene dichloride, 27·3 per cent. carbon tetrachloride, 5 per cent. methyl bromide and 1 per cent. chloropicrin at 30 oz. ultimately gave complete kill of all but *Calandra* and *Plodia*, for which the final mortalities were 85·1 and 87·8 per cent., a product containing 70 per cent. ethylene dichloride, 29 per cent. carbon tetrachloride and 1 per cent. γ BHC at 60 oz. ultimately gave complete kill of all but *Calandra*, for which the final mortality was 94·7 per cent., heptachlorobutylmercaptan at 60 oz. gave complete kill of *Rhizopertha* within the exposure period and of *Tribolium* within 12 days and 90·8 and 93·1 per cent. final mortality of *Calandra* and *Plodia*, respectively, and acrylonitrile at 9 oz. was as effective as the last against *Rhizopertha* and *Tribolium* and gave 71·3 and 97·8 per cent. final mortality of *Calandra* and *Plodia*.

When the exposure was for 48 hours, the first ethylene-dichloride mixture gave complete final kill of *Calandra* and all the other materials complete kill within the exposure period, the second ethylene-dichloride mixture, the mercaptan and acrylonitrile gave complete kill of *Plodia* within the exposure period, and the last two also gave complete kill of *Tribolium* within the exposure period.

Melis (A.). **Esperienze di lotta contro la mosca delle olive** (*Dacus oleae* **Gmel.) in Italia nel 1953.** [Experiments on the Control of *D. oleae* in Italy in 1953.]—*Redia* **39** (1954) pp. 37–74, 1 graph, 5 fldg. tables, 1 ref. Florence [1955]. (With a Summary in English.)

Large-scale experiments were carried out in various parts of Italy, including Sicily and Sardinia, in 1953 with bait-sprays for the control of *Dacus oleae* (Gmel.) on olive [*cf. R.A.E.*, A **43** 84], to determine whether the treatments that had given good results in Tuscany in 1951–52 [*cf.* **43** 136, etc.] would prove equally effective in other areas. The sprays were applied to some 500,000 trees in Tuscany, Apulia, Liguria, Sicily and Sardinia, and treatments were carried out at about the same times in all areas. The Berlese mixture of sodium arsenite and molasses [*cf.* **41** 393] was used in Liguria and Sardinia, the Berlese mixture or the De Cillis

mixture of grape must, sugar and sodium orthoarsenite [*cf.* **43** 136] in Tuscany and Apulia, and the Petrosini mixture of molasses, sodium arsenite, attractant and substances to prevent drying of the deposit [*cf.* **43** 137] in Sicily. The Berlese mixture was diluted 1:9 and the others 1:19, so that the percentage of toxicant was 0·25–0·3 per cent. It was intended to apply the sprays six times between 20th June and early November, but frequent rain hindered the last applications, especially in Apulia and Sicily. The olives were examined for infestation in early October and again in early November, after which date fresh attacks do not seriously reduce the quality of the fruits or the oil from them. The percentages of fruits infested on the treated and (in brackets) untreated trees on the two dates were 4·1–25·8 (6·8–96·3) and 2·7–89·5 (20–100), respectively, in Tuscany, 0 (7–9·2) and 15·6–26·5 (33–58) in Apulia, 0–5·4 (91–94) and 77–99·4 (100) in Sicily, 1·2–18 (69–83) and 47–91 (96–98·5) in Sardinia and 0–10 (3·3–100) and 3·7–44 (78·7–100) in Liguria.

Subsidiary experiments in which other treatments were combined with the use of bait-sprays were carried out in Tuscany. In two groves, in which infestation had previously been difficult to control with bait-sprays alone, bait-traps of the type developed in Spain [*cf.* **35** 151] containing 2 per cent. diammonium phosphate, which was renewed monthly, were hung in the treated trees, usually at the rate of one per three trees, from early July to November. The numbers of adults of *D. oleae* taken averaged 3·3, 0·23, 4·6, 40 and 4·97 per tree in the five months, respectively, in the first grove, and the percentages of fruits infested on the treated trees and (in brackets) on those given the bait-spray only were 14·8–17·4 (93·5–96·3) and 14·7–44·5 (100) in early October and early November, respectively, in the first grove and 13 (73·9) and 15·8 (100) in the second. In a third grove, the bait-traps were not hung in the sprayed trees until 15th September, to ascertain whether they would be effective in arresting infestation, which had already risen to 35–75 per cent., and the corresponding figures were 7·1–22·2 (9·2–13·6) and 74·2–90·8 (20–42·1), respectively. The fact that the bait-traps were hung in the most severely infested trees is held to account for the higher infestation percentages as compared with the controls.

In a fourth grove, trees on which infestation was particularly heavy in mid-September (89 and 42 per cent. of the fruits on two varieties, respectively, being infested), in spite of bait-spray treatment, were sprayed on 24th–25th September with an emulsion product containing 50 per cent. malathion or a wettable powder containing 15 per cent. parathion, both at 0·5 per cent., to ascertain whether the infestation could be held in check by a single application. On 29th September, the percentages of fruits infested on the two varieties were 49 and 16·6, respectively, for malathion and 53·17 and 31·2 for parathion. On 2nd October, 92 per cent. of the larvae in fruits from trees treated with malathion were living, as compared with 52·1 per cent. of those from parathion-treated trees, and on 29th October, the infestation percentages were 79 for malathion and 37·5 for parathion, the larvae present all being very small.

It is concluded that bait-sprays are normally effective for the control of *D. oleae*, failures being due to special circumstances, such as excessive rainfall, which washes the deposits from the trees and prevents retreatment, as occurred in Apulia and Sicily, or insufficient isolation from untreated olives, which permits reinfestation, as occurred in the tests in Sicily. The number of applications should probably be increased to ten, beginning about 25th June and finishing in early November. The use of bait-traps as an adjunct to bait-sprays gives further control, provided that they are used from early July onwards, and is suggested for centres of infestation from which migration may occur. A similar use of phosphorous sprays is no more effective than

these used alone, but permits them to be restricted to particularly heavily infested parts of a grove.

MARTELLI (M.). **La *Pristiphora conjugata* Dahlb. (Hymenoptera Tenthredinidae) in Toscana.** [*P. conjugata* in Tuscany.]—*Redia* **39** (1954) pp. 157–185, 16 figs., 22 refs. Florence [1955]. (With a Summary in English.)

Investigations in 1948–51 showed that considerable damage to the leaves of poplars in central and northern Italy is caused by the larvae of the Tenthredinids, *Trichiocampus viminalis* (Fall.), *Nematus caeruleocarpus* Htg., *Pristiphora conjugata* (Dhlb.) and *Stauronema* (*Lygaeonematus*) *compressicornis* (F.), of which the first three are the most important. *T. viminalis* is the most injurious in Piedmont and Cadore, *N. caeruleocarpus* in Lombardy and Emilia, and *P. conjugata* in Tuscany.

Notes are given from the literature on the food-plants of the palaearctic species of *Pristiphora*, the distribution in Italy of the 16 Italian species is shown in a table, and the egg, larva and adults of *P. conjugata* and its world distribution are described. The first adults of *P. conjugata* appeared in the field between 18th April and 16th May in the various years of the observations. Females were more numerous than males, which formed only 7 per cent. of the second generation in 1950. Oviposition began about ten days after emergence, unfertilised females giving rise to males only. The eggs were inserted into slits in the edge of the leaf, the number per leaf being usually 6–10 but ranging up to 28. The average numbers of eggs per female were 60–100, with a maximum of 107. The larvae hatched in about 3–4 days, though sometimes up to a week was required, and fed gregariously on the leaves, from the lower surface, sometimes skeletonising them completely in the later instars. The larval stage averaged 12–15 days, but lasted eight days in July 1948 and 17 days in May–June 1948. Pupation occurred in dead leaves and trash at the foot of the trees or occasionally in the surface soil. Some full-fed larvae of each generation entered diapause, the proportion doing so increasing as the season advanced, and gave rise to adults at the same time as a later generation in the same year, or, except in the case of the first generation, not until the following spring. The pupal stage lasted 7–16 days, with an average of about 8–10 days. There were three generations a year in 1948 and 1950, but evidence was obtained in 1949 of strains with three and four generations a year. The only parasite reared was a single example of *Angitia* sp. Clean cultivation and the application of lime to the soil round the trees are recommended for control.

FREDIANI (D.). **Ricerche morfo-biologiche sull' *Acrolepia assectella* Zell. (Lep. Plutellidae) nell'Italia centrale.** [Morphological and biological Investigations on *A. assectella* in Italy.]—*Redia* **39** (1954) pp. 187–249, 1 pl., 36 figs., 36 refs. Florence [1955]. (With a Summary in English.)

Descriptions are given of all stages of *Acrolepia assectella* (Zell.), which is an important pest of leeks and to a less extent of onions near Pisa, together with an account of observations on its bionomics in 1952–53. Since these gave results that differed somewhat from those recorded from other parts of Europe [*cf. R.A.E.*, A **34** 69, 92, 215, etc.], adults from Pisa were compared with material from Switzerland and Austria. No differences in genitalia were found, but the coloration of the forewings differed in the Pisan examples from that of the others, possibly justifying subspecific rank

for the former, and the forewings of all three lots are therefore described in detail.

The observations showed that there were 5–6 generations a year near Pisa, the adults first appearing in mid-May, the second half of June, the second half of July, the second half of August, late September and late December, respectively. Those of the summer generations survive for 7–10 days and those of the last two for 3–4 months. The females usually oviposited within a day of pairing, laying about 100 eggs each in 3–5 days on the central leaves of the leeks. The larvae hatched in 4–6 days in April–August and 8–11 days in October–November and mined the leaves, emerging from time to time to begin new mines. The duration of the larval stage varied with temperature and was 12–17 days in April–August, 49 in October–November, 53–61 in October–December, and 117–119 in November–March. Cocoons were usually constructed on the older leaves or occasionally on the base of the plant or on the stalks of the inflorescences of leeks grown for seed. There was a prepupal stage of 1–2 days, and the pupal stage lasted 13 days in March, 16–22 days in April–May, 9–10 in June, 8 in August, 10–15 in August–September, 15 in November–December, 17–36 in December–January and 78 in December–February. The overwintering population consisted of a few adults of the fifth generation that did not pair until the following spring, larvae of the sixth generation that pupated from November onwards, and the resulting pupae and adults. Sixth-generation larvae formed the bulk of the population until January, but increasing numbers of pupae and adults were found from then onwards. Adults that emerged in the course of the winter constituted the main source of spring infestation, since most of the larvae and pupae perished when the leeks were harvested, between October and the end of February.

The only parasites reared from *A. assectella* were the Ichneumonids, *Thyraeella collaris* (Grav.) and *Itoplectis alternans* (Grav.), which have not been previously recorded from this host. *T. collaris* oviposited in the newly formed cocoons, and the percentage parasitism was 0·1 in 1952 and 11·4 in 1953. The ratio of males to females was 1:5. *T. collaris* was itself parasitised in 1953 by a species of *Eupteromalus* identified as *E. nidulans* (Först.) [*cf.* **18** 151]. *I. alternans* was rare.

Since the population of *Acrolepia* is small at the beginning of the year, the damage to leek seedlings is slight. The attack does not become severe until August–September, after which the percentage of plants infested reached 40 or more in both years. The number of larvae per plant ranged up to eight, 5–6 being sufficient to prevent normal growth. Since onions near Pisa are harvested in July–August, they escape the heaviest attack.

In a test on control in October 1953, infested leeks were sprayed with 0·01 and 0·02 per cent. parathion. The numbers of larvae per plant averaged 3·5 and 4, respectively, before treatment and 3 and 0·5 after it, only those individuals that were reached by the spray being killed. Several applications would have to be made during the season to obtain good control; they should be directed against the newly hatched larvae before they enter the leaves.

Ciampolini (M.). **Osservazioni sul** *Calotermes flavicollis* (**F.**) (**Isoptera**) **in Toscana.** [Observations on *Kalotermes flavicollis* in Tuscany.]—*Redia* **39** (1954) pp. 291–300, 3 pls., 1 fig., 24 refs. Florence [1955]. (With a Summary in English.)

Observations begun in 1952 showed that *Kalotermes* (*Calotermes*) *flavicollis* (F.) is widely distributed in Tuscany, colonies being observed in living trees, a list of which is given, dead or dying stumps and props fixed into

the ground. Only trees that showed some injury, such as that resulting from pruning, or were in part already dead or diseased appeared to be attacked, though once the colony was established, a few small galleries were sometimes found in the healthy parts of the wood. Building timbers were not infested. The first alates were observed in early July, and most of them left the nests in August–September, though some swarming also occurred in October–November.

Fenili (G. A.) & Zocchi (R.). **Esperienze di lotta contro la** *Rhagoletis cerasi* **L.** [Experiments on the Control of *R. cerasi*.]—*Redia* **39** (1954) pp. 301–308, 1 pl., 1 fldg. table. Florence [1955]. (With a Summary in English.)

Experiments on the control of *Rhagoletis cerasi* (L.) on medium and late varieties of cherry were carried out near Modena in 1954. The first adults of this fruit-fly appeared on 15th–20th May, and frequent rain hindered the application of sprays. Three groups of trees were treated on 19th and 24th May and 7th June with a bait-spray prepared from a mixture of 89 per cent. sugar and other attractants, 5 per cent. adhesives and substances to prevent drying, and 6 per cent. micronised lead arsenate, diluted 1:19, and equal numbers of bait-traps of the Spanish type [*cf. R.A.E.*, A **35** 151] were hung among the trees of two of the groups at the rate of about two per three trees on 8th–10th May. The liquids in the traps were renewed on 25th May and 10th June and consisted of 3·5 per cent. diammonium phosphate in one group, and water in which bran had been allowed to ferment, with 3 per cent. salicylic acid, in the other. A fourth group of trees was sprayed on the same dates with a similar mixture in which parathion replaced lead arsenate. Fruits were examined on 26th June, and the percentages infested, as compared with 77·8 for no treatment, were 3·3, 47·5, 2·6–2·9 and 40·5, for the four groups, respectively. Of the 3,239 adults taken in the bait-traps from 21st June to 3rd July, all but 39 were taken in those containing diammonium phosphate, which is therefore considered a very effective attractant. It is thought that the inferior results given by the parathion bait-spray may have been due to a repellent odour.

A further group of trees was sprayed with DDT at 0·2 per cent. on 19th May and 0·1 per cent. on 27th May; frequent rains washed the deposits from the trees, and 39·8 per cent. of the fruits were infested by 26th June.

Ciampolini (M.) & Zocchi (R.). **La lotta antitermitica in Toscana. Mezzi adottati per la disinfestazione e la difesa della Certosa di Firenze.** [The Control of Termites in Tuscany. The Measures adopted for the Disinfestation and Protection of the Certosa Monastery near Florence.] —*Redia* **39** (1954) pp. 309–325, 3 pls., 6 figs., 1 fldg. map, 10 refs. Florence [1955]. (With a Summary in English.)

Further records are given of injury by *Reticulitermes lucifugus* (Rossi) to timbers in buildings in Tuscany [*cf. R.A.E.*, A **43** 137], together with an account of the control operations carried out in the Certosa monastery near Florence, where parts of the woodwork were found to have been severely damaged by this termite. The measures adopted included the destruction of foci outside the walls, protective soil treatment with a mixture of DDT and BHC, the use of various insecticides, including fumigants, in the interior, the removal of all damaged wood, part of which was replaced after treatment

with pentachlorophenol or other materials, and preventive treatment of much of the remaining woodwork.

Fenili (G. A.). **Esperienze di lotta con dieldrin contro il** *Dacus oleae* **Gmel. nella Toscana litoranea durante il 1954.** [Experiments on the Control of *D. oleae* on the Coast of Tuscany in 1954.]—*Redia* **39** (1954) pp. 327–343, 2 figs., 1 ref. Florence [1955]. (With a Summary in English.)

Further tests on the value of dieldrin for the control of *Dacus oleae* (Gmel.) on olive on the coast of Tuscany [*cf. R.A.E.*, A **42** 112] were made in 1954, when infestation developed rather late and injured fruits were not found until early July. The products used were a wettable powder containing 50 per cent. dieldrin and a paste containing 70 per cent. dieldrin that produced an emulsion on mixing with water; a wetter and adhesive was added to both. Two groups of trees were sprayed four times, with a power spray, on 5th–8th July, 10th–12th August, 6th–8th September and 11th–12th October. The two materials were applied on the first date in normal sprays containing 0·075 and 0·07 per cent. actual dieldrin, respectively, and on the three others in concentrated sprays containing 1 and 1·05 per cent. dieldrin at one-twentieth the former volume. On 15th July, bait-traps containing 2·5 per cent. diammonium phosphate were hung in treated and untreated trees, and the numbers of adults found in them on 9th August, 10th September, 5th October and 6th November, when the liquid was renewed, are shown in tables. Large numbers were not found until October, and the catches were always lowest on the trees treated with the emulsion spray. The percentages of olives infested on the two lots of treated trees and (in brackets) on untreated ones were 4·88 and 5·2 (15·05) on 25th August, 3·6 and 5·22 (16·7) on 7th September, 4·97 and 7 (25·8) on 5th–6th October and 2·4 and 6 (55·6) on 6th November. On this last date the percentage of olives infested on untreated trees isolated from the experimental area was 63.

Two further groups of trees were treated on 7th and 22nd September and 12th October with atomised sprays prepared from the same products and containing 2 and 2·1 per cent. dieldrin, respectively. The percentages of olives infested were 9·5 and 9·1 on 5th–6th October and 1·6 and 5·2 on 6th November. The apparent reduction in infestation in November was due to the fall of infested fruits. Dieldrin had no effect on the immature stages within the olives and killed only the adults.

Ciampolini (M.) & Terrosi (U.). **Esperienze di lotta con esteri fosforici contro il** *Dacus oleae* **Gmel. nella Toscana litoranea nel 1954.** [Experiments with Phosphoric Esters for the Control of *D. oleae* on the Coast of Tuscany in 1954.]—*Redia* **39** (1954) pp. 345–359, 1 graph, 1 fldg. table, 2 refs. Florence [1955]. (With a Summary in English.)

Tests with phosphorus insecticides against *Dacus oleae* (Gmel.) on olive on the coast of Tuscany [*cf. R.A.E.*, A **41** 347, etc.] were continued in 1954 with proprietary products containing parathion, malathion, Diazinon [O,O-diethyl O-2-isopropyl-4-methyl-6-pyrimidinyl thiophosphate] and a mixture of Diazinon and DDT. The insecticides were applied as emulsion sprays containing 0·02 per cent. Diazinon, 0·1 per cent. parathion or 0·3 per cent. malathion and as wettable-powder sprays containing 0·02 per cent. Diazinon, 0·0975 per cent. parathion or a mixture of 0·1 per cent. DDT and 0·02 per cent. Diazinon. A further spray containing 0·15 per cent. DDT and 0·02 per cent. Diazinon was prepared from a soluble paste. All the

sprays, except the parathion emulsion, which was applied 1–2 times, were applied three times (on 7th–8th and 27th–28th September and 14th–15th October), twice (on the last two dates only) or once (on the second date only).

Olives from trees sprayed for the first time on 27th–28th September were examined three days later for counts of egg mortality, and the mortality percentages, as compared with 0 for no treatment, averaged 61·25, 59·5 and 15 for Diazinon, parathion and malathion, respectively, in emulsion sprays, 38·75 and 41·75 for Diazinon and parathion in wettable-powder sprays, and 38 and 21·5, respectively, for the mixtures of Diazinon and DDT. The effect on the larvae was also investigated after the same treatment. Only parathion showed any effect in three days, killing averages of 30·87 and 33·12 per cent. of the larvae, all of medium size, in emulsion and wettable-powder sprays, respectively, but all the materials had some effect in 7–8 days, the percentages killed averaging 46·7, 99 and 3·75 for Diazinon, parathion and malathion in emulsion sprays, 32·2 and 92·25 for Diazinon and parathion in wettable-powder sprays, and 4·5 and 2 for the mixtures. All the larvae killed by Diazinon alone or with DDT and most of those killed by parathion and malathion were of medium size. The results are taken as further evidence that phosphorus insecticides penetrate into the fruits and act as stomach poisons [*cf. loc. cit.*]. The parathion emulsion spray was still highly effective 10–15 days after treatment, whereas the other materials had lost much of their toxicity by that time.

The percentages of fruits free from injury on 5th–7th November on trees treated once, twice or three times, as compared with 18·25 for no treatment, were 60, 50·25 and 71, and 75, 81·75 and 91, for Diazinon in the emulsion and wettable-powder sprays, respectively, 69, 80·5 and 87 for parathion in the wettable-powder spray, 42, 54 and 82 for malathion, and 87, 89·75 and 95 and 89·5, 90·5 and 96 for the mixtures; one and two applications of the parathion emulsion spray resulted in 94·5 and 98·25 per cent. uninjured fruits, respectively. The difference between one emulsion application of parathion and one of Diazinon was highly significant.

Ciampolini (M.). **Prove di lotta invernale contro le uova di *Lachnus longipes* Duf.** [Tests on the Control of Winter Eggs of *L. longipes*.]—*Redia* **39** (1954) pp. 395–399, 2 pls. Florence [1955]. (With a Summary in English.)

The branches of grafted chestnut trees near Florence were found in the winter of 1953–54 to be infested to various degrees with eggs of *Lachnus longipes* (Duf.), and emulsion sprays were applied for their control on 9th–10th March 1954. The mortality percentages, as compared with 9·54 for no treatment, were over 99 for 0·05 per cent. parathion, 1 per cent. of a product containing 38 per cent. of the triethanolamine salt of dinitroisobutylphenol, and a mixture of 1·5 per cent. light oil and 0·25 per cent. parathion, 98·73 for 6 per cent. of a product containing 41 per cent. mineral oils, 33 per cent. tar oil and 10 per cent. phenol, 97·73 for 5 per cent. of a product containing 70 per cent. mineral oil and 3 per cent. DNC, 35·91 for a mixture of 0·3 per cent. malathion and 1·5 per cent. light oil, 33·67 for 2 per cent. of a product containing 80 per cent. highly refined oil, 14·91 for a mixture of 0·06 per cent. Diazinon (O,O-diethyl O-2-isopropyl-4-methyl-6-pyrimidinyl thiophosphate) and 0·006 per cent. Isolan (1-isopropyl-3-methyl-5-pyrazolyl dimethylcarbamate), 11·27 for 0·06 per cent. Diazinon, and 8·54 for 0·15 per cent. malathion. There were no significant differences between the results given by the first five products.

Domenichini (G.). **Variabilità dei caratteri e nuova diagnosi di un tisanide (Hym. Chalcidoidea) con la descrizione di una nuova specie.** [Variability in the Characters and a new Identification of a Thysanid, with the Description of a new Species.]—*Boll. Zool. agr. Bachic.* **21** fasc. 1 pp. 3–20, 4 figs., 9 refs. Milan, 1955.

The author agrees that the hyperparasite of *Planococcus* (*Pseudococcus*) *citri* (Risso) in Italy originally considered by him to be *Thysanus elongatus* (Gir.) [*R.A.E.*, A **42** 340] is in reality *T. subaeneus* (Först.) [*cf.* **44** 109]. He compared it with specimens from Poland and Turkey considered by Novitzky to be *T. subaeneus* and concludes that though the Polish material was in fact that species, the Turkish specimens represented a new species, which he describes from adults of both sexes as *T. novitzkyi*, sp.n. Constant and variable characters possessed in common by *T. subaeneus*, *T. elongatus* and *T. novitzkyi* and characters of the male genitalia differentiating them are described. Novitzky considered a dark-winged example of *T. subaeneus* from Poland to represent a distinct variety [for which he proposed the name *thorunensis* (*cf.* **44** 109)], but doubt is thrown on the validity of this assumption since the wing colour was found to vary with the age of the specimens. *T. novitzkyi* was taken at Konya in 1934 on plants heavily infested by Aphids, but its bionomics are unknown.

Grandori (R.) & Rota (P.). **Esperimenti di lotta contro** *Metatetranychus ulmi* **con il prodotto R. 6199.** [Experiments on the Control of *M. ulmi* with Product R 6199.]—*Boll. Zool. agr. Bachic.* **21** fasc. 1 pp. 53–68, 1 col. pl., 3 graphs, 1 ref. Milan, 1955. (With Summaries in French and English.)

R 6199 [the hydrogen-oxalate salt of O,O-diethyl S-2-diethylaminoethyl phosphorothiolate], which has shown outstanding acaricidal properties in Britain [*cf. R.A.E.*, A **44** 133], is a white crystalline substance with a negligible vapour pressure and is readily soluble in water, but is hydrolysed in alkaline solutions, though it has been used successfully with lime-sulphur. It inhibits mammalian cholinesterase and is about half as toxic as parathion by cutaneous absorption. Oral administration of a single dose at the rate of 6 mg. per kg. body weight is toxic to mice, and a dosage of 27 parts per million in the food killed two out of six mice in four days and caused symptoms of poisoning in the others. Apples treated with solutions of R 6199 at 10–40 p.p.m. and tested a fortnight later showed an anticholinesterase activity corresponding to that of not more than 0·1 p.p.m.

Tests of its toxicity to *Metatetranychus ulmi* (Koch) on apple were carried out in two localities in northern Italy in 1954. In the first, the trees were sprayed on 28th July with R 6199 at 27·5 p.p.m. (equivalent to about one capsule per 100 gals.), and some received a second application on 4th August. The adults, nymphs and eggs on 20 sample leaves were counted at weekly intervals, and the respective numbers were 362, 819 and 2,176 before the first application and 170, 281 and 882 a week after it, as compared with 419, 729 and 1,582 for no treatment. On 11th August, the numbers on trees treated once and (in brackets) twice were 102, 182 and 436 (12, 4 and 15), as compared with 1,028, 386 and 830 for no treatment. Infestation remained negligible throughout the season on trees treated twice. It reached its maximum on the untreated trees on 25th August, when the numbers were 979, 1,074 and 3,300 and the leaves showed very severe bronzing, but on those treated once, the numbers on that date were 20, 86 and 271, which were within the limits of tolerance, the leaves, which had shown signs of attack in early August, were again green, and new growth was visible. By

22nd September, infestation had practically disappeared from all the trees, but though numerous winter eggs had been laid on the untreated trees, there were only about one-tenth as many on those treated once, and very few on those treated twice. When one application of R 6199 at 50 p.p.m. was made on 18th August, it reduced infestation to an insignificant level within a week, after which the mites gradually disappeared, and very few winter eggs were laid.

In the second locality, the trees were sprayed at 27·5 p.p.m. on 26th June, when there were 296, 188 and 4,979 adults, nymphs and eggs, respectively, per 40 leaves. Infestation was reduced to a very low level in a month, the numbers being 6, 7 and 94 on 27th July, as compared with 438, 972 and 2,103 for no treatment. The treated trees did not show many signs of attack and recovered from any damage suffered initially. Some of the treated trees received a second application on 7th July, which was repeated on 9th July because of rain. The population on these had almost disappeared by 14th July and died out completely in September. In late October, winter eggs were too numerous to count on untreated trees, fairly numerous on those treated once and very rare on those treated twice.

It is recommended from these results that R 6199 at 27·5 p.p.m. should be applied twice at an interval of not more than a week, the second application controlling any mites that escape the first spray and any eggs laid after it.

Brusa (L.) & Corsi (M.). **Lotta contro il *Cryptorrhynchus lapathi* L., parassita del pioppo, mediante irrorazioni di un insetticida a base di E.C.E.** [The Control of *C. lapathi*, a Pest of Poplar, with Sprays containing BHC.]—*Ann. Sper. agr.* (N.S.) **10** no. 1 pp. 109–117, 2 figs., 4 refs. Rome, 1956. (With a Summary in English.)

In June 1953, young poplars in a plantation near Turin were found to be severely infested by *Cryptorrhynchus lapathi* (L.), and experiments on the control of this weevil were carried out with the object of killing the newly emerged adults before they could oviposit. In the laboratory, infested material in cages was sprayed on 19th June with 0·1 per cent. wettable BHC. Adults emerged from 20th June until early July. The first dead weevil was observed on 24th June, but mass mortality did not occur until 10th–20th July. All the insects were dead by 22nd July, whereas mortality in the controls was not complete at the end of that month. In the field, where emergence did not begin until the first week of July, the trunks and branches of 3,000 trees in the affected plantation were sprayed with 0·2 or 0·3 per cent. wettable BHC between 10th and 20th July. It was impossible to estimate the results immediately, but observations in the following year showed that infestation was very much reduced. It is concluded that although the toxic action of the BHC was slow, it caused an immediate reduction in oviposition.

Dussel (J.). **Les traitements insecticides par nébulisation en arboriculture.** —*Phytoma* **7** no. 64 pp. 18–20, 1 graph. Paris, 1955.

The first part of this paper comprises an account of experiments in France already noticed in which sprays prepared from a parathion emulsion concentrate were tested against *Cydia pomonella* (L.) on apple and pear. The concentrations of parathion used were 0·0225 per cent. for the conventional spray and 0·15 per cent. for the mist spray and not as stated in the earlier abstract [*R.A.E.*, A **44** 104]. In a test recorded in the second part, the

parathion mist spray was applied in autumn to peach trees heavily infested by the mealy peach aphis, *Hyalopterus amygdali* (Blanch.) (*arundinis*, auct.) [*cf.* **44** 101]. Control was complete in three days on the smaller trees, but colonies of the Aphid persisted on the taller ones, which could not be satisfactorily treated with the apparatus used.

Lucas (J. R.) & Darrigrand (M.). **Quelques observations au sujet d'attaques graves de la Cécidomyie des feuilles de poirier dans les Basses-Pyrénées et les Landes.**—*Phytoma* **7** no. 64 pp. 21–23, 5 figs., 4 refs. Paris, 1955.

In France, *Dasyneura pyri* (Bch.) has recently caused increasing damage to the leaves of pear in nurseries and orchards in the Departments of Basses-Pyrénées and Landes, though it had not previously been of importance in the area. Its bionomics are briefly reviewed from the literature [*cf. R.A.E.*, A **27** 296]. Observations in 1954 showed that adults of this Cecidomyiid appeared about 1st–4th April, 13th–15th May, 18th–20th June, 14th–17th July, 6th–10th August, 1st–3rd September and 5th–6th October, and there are thought to be six generations a year with a possible partial seventh. The attack became severe on one variety in late May, and freshly rolled leaves were found up to mid-October. Aldrin, dieldrin and parathion incorporated into the soil or scattered on the surface, round the trees or throughout the orchard, on 24th–26th March gave no control of the adults emerging from the soil, and a parathion emulsion spray applied to the trees on the 2nd–3rd and 24th April also proved ineffective.

Balcells R. (E.). **Sobre una *Trioza* (Hem. Psyllidae) parásita de la patata.** [On a Species of *Trioza* on Potato.]—*Ilerda* **17** repr. 18 pp., 6 pls., 15 refs. Lerida, 1953.

Descriptions are given of all stages of an unidentified species of *Trioza* that was taken on the leaves of potato in the Province of Lérida, Spain, in 1951.

van Koot (IJ.), van Slogteren (D. H. M.), Cremer (M. C.) & Camfferman (J.). **Virusverschijnselen in Freesia's.** [Virus Diseases in Freesias.]—*Tijdschr. PlZiekt.* **60** pt. 4 pp. 157–192, 6 pls., 9 refs. Wageningen, 1954. (With a Summary in English.)

Symptoms of virus disease of the mosaic type have become increasingly common on *Freesia* in Holland, and investigations on their causes and mode of spread were begun in 1947. The symptoms, which are described, include spots and stripes on the leaves and flowers, and in severe cases the flowers open only partly or not at all. Serological tests, a detailed account of which is given, showed that two viruses were involved. Of these, one was hitherto unknown and is referred to as *Freesia* virus and the other was identified as *Phaseolus* virus 2. *Freesia* virus was found alone, but it was not possible to determine whether the *Phaseolus* virus was alone or accompanied by *Freesia* virus. The latter caused less pronounced symptoms, and infection with it was found to be widespread among different varieties of *Freesia*, although some were symptomless carriers: the *Phaseolus* virus was much less common. Field observations indicated that the *Freesia* virus is not transmitted through the seed, but it persists in the corms, the symptoms

generally becoming more violent through propagation, and it was transmitted by sap inoculation in tests. The Aphids, *Myzus persicae* (Sulz.), *M.* (*Aulacorthum*) *circumflexus* (Buckt.), *Macrosiphum* (*A.*) *solani* (Kalt.) and *M. solanifolii* (Ashm.) (*euphorbiae*, auct.) were found on infected *Freesia*, and as the last was the commonest, it was used in transmission tests, which were carried out before it was known that more than one virus was concerned. When Aphids were allowed to feed on plants showing mosaic symptoms, kept without food for various periods, and then transferred in batches of four to healthy plants, mosaic symptoms were observed on the latter, generally in the following year, the proportion of plants that showed symptoms varying with the variety used and increasing with the periods of infection-feeding and test-feeding but being little influenced by the duration of the fasting period. *Phaseolus* virus 2 is known to be transmitted by Aphids, but in view of the lack of symptoms in a variety in which it is known to produce definite symptoms, *Freesia* virus is assumed to have been the principal virus transmitted. The *Phaseolus* virus has been recorded in *Freesia* in Canada, and an outbreak of mosaic symptoms in 1950 on *Freesia* plants grown next to infected broad beans in a greenhouse in which *M. solanifolii* was present on both plants indicated that it can be transmitted from beans to *Freesia* by the Aphid.

In tests on the control of *M. solanifolii*, Systox [diethyl 2-(ethylmercapto)-ethyl thiophosphate (demeton)] gave outstanding results, *Freesia* plants watered with a 0·025–0·05 per cent. solution giving complete mortality in 24 hours of Aphids placed on them two days after treatment and maintaining this toxicity for 18 days. Spraying the leaves with 0·05 per cent. Systox was also effective, but toxicity decreased more rapidly. Other systemic insecticides gave less striking results, and a spray of 0·1–0·2 per cent. parathion was initially effective but lost its toxicity in 2–5 days.

Saaltink (G. J.) & Ticheler (J.). **De bestrijding van emelten** (*Tipula* **spp.).** [The Control of Leatherjackets (*Tipula* spp.).]—*Tijdschr. PlZiekt.* **60** pt. 4 pp. 193–198, 4 refs. Wageningen, 1954. (With a Summary in English.)

An account is given of tests in Holland in 1950–53 in which several insecticides were tested in bran baits, the bran being applied at 22·5 lb. per acre, and compared with parathion both in a bait and as a spray, for the control of larvae of *Tipula* spp. When grassland in several localities was treated and counts were based only on the numbers of dead larvae found on the soil surface three days later, the results were variable, but a spray of 0·08 per cent. of a product containing 25 per cent. parathion and a bait containing 1·8 cc. of the product per lb. bran were significantly better than BHC or paris green in baits, and baits containing derris or DDT were unsatisfactory. In subsequent tests on arable land, sample diggings were also made in the treated plots, the larvae found in the soil being kept in petri dishes in the laboratory and observed for mortality for 14 days, and the results were then considerably modified. Thus, on plots in one locality treated in April 1952 with baits containing 1 per cent. actual BHC, 4 per cent. paris green, or the parathion product at the rate of 1·8 cc. per lb., the numbers of dead larvae per sq. metre of soil surface were 4, 1 and 9, respectively, but 54, 77 and 46 per cent., respectively, of the larvae found in the soil died within 14 days, as compared with 9 per cent. for no treatment. A spray of 0·06 per cent. of the parathion product was ineffective, but a bait containing 4 per cent. chlordane gave promising results in April 1953. Treatment should be made when night temperatures are expected to exceed about 7°C. [44·6°F.], as the larvae are then more active.

Nuorteva (P.) & Nuorteva (S. L.). **Das Auftreten holzzerstörender Insekten in einigen Schärenkirchspielen Südwestfinnlands.** [The Occurrence of Wood-destroying Insects in certain Parishes in South-west Finland.] —*Ann. ent. fenn.* **20** (1954) no. 4 pp. 164–171, 1 map, 14 refs. Helsinki, 1955. (With a Summary in English.)

Investigations were carried out in 1952 on the occurrence of wood-destroying insects in three adjoining parishes in the islands off the south-west coast of Finland, 185 wooden dwelling-houses, the articles of furniture in them, and 69 outhouses being individually inspected by a method adopted in Sweden [*cf. R.A.E.*, A **40** 361]. *Anobium punctatum* (Deg.) was found infesting 56 per cent. of the houses and the same proportion of the furniture, damage to the latter being the more severe. *A. pertinax* (L.) was also found, though not in the furniture, but it was less widely distributed and present in smaller numbers. There were local variations in the distribution of *Anobium* spp., and the infestation percentages among houses built 1–30, 31–60, 61–90 and 91–150 years previously were 36, 68, 70 and 63, respectively. About 82 per cent. of the outhouses were infested. *Buprestis* spp., probably chiefly *B. haemorrhoidalis* Hbst., infested 22 per cent. of the houses, but mostly caused little damage. Living larvae were found in the timbers of buildings 14–150 years old, and 2 per cent. of the furniture was infested and rendered unfit for use. *Callidium violaceum* (L.) and *Ernobius mollis* (L.) were found in the unbarked roof timbers of 90 and 84 per cent. of the houses, respectively, but the damage was usually slight, and only 78 and 76 per cent., respectively, of the houses built in the previous 30 years were infested, sawn roof-timbers having been used in that period. Considerable damage was caused by *Camponotus herculeanus* (L.), particularly to the lower parts of walls and to bath-houses, 9 per cent. of the houses and eight of the 16 bath-houses inspected being infested. Occasionally damage had been caused to house timbers by *Sirex juvencus* L. and *Urocerus* (*S.*) *gigas* (L.), and very slight damage by larvae of *Dermestes lardarius* L. seeking pupation sites.

Nuorteva (M.). **Versuche über den Einfluss der Bevölkerungsdichte auf die Nachkommenzahl des Grossen Waldgärtners,** *Blastophagus piniperda* **L.** [Tests on the Effect of Population Density on the Progeny of *Myelophilus piniperda*.]—*Ann. ent. fenn.* **20** (1954) no. 4 pp. 184–189, 3 figs., 5 refs. Helsinki, 1955.

Tests on the effect of over-population on *Myelophilus* (*Blastophagus*) *piniperda* (L.) were carried out in southern Finland in May–July 1954 on the stems of three healthy pine trees that had been cut about five feet from the ground and topped. The ends were covered with plastic and each stem was encased in wire screening and divided into three isolated sections by making incisions into the sapwood at the top and bottom and intermediately and wiring the screening into the stem at these points. The thickness of the bark was 4–14 mm., and thus less than the optimum of 2 cm. previously recorded for this bark-beetle [*R.A.E.*, A **23** 223]. Varying numbers of adults of *M. piniperda* caught while in flight or when oviposition had already begun were released in the sections, and counts of egg-galleries and of progeny (including larvae and pupae) made when the first adults of the new generation left the bark showed that the numbers of individuals per egg-gallery was highest (33·3) at an egg-gallery density of 31·6 per sq. metre, broods at lower densities being probably adversely affected by the natural reaction of the tree and those at higher ones decreasing to a minimum of 1·2 individuals at 207·6 egg-galleries per sq. metre. The

number of progeny per sq. metre reached its maximum (1,659 individuals) at a density of 61·6 egg-galleries per sq. metre. The length of the egg-galleries averaged 4·9–10·8 cm. and did not appear to be affected by density. Observations on snow-felled pines confirmed that over-population results in a decrease in the number of progeny, but showed that densities in the field are much higher than those in the tests.

Vité (J. P.). **Zum gegenwärtigen Stand der Erfahrungen mit** *Taeniothrips laricivorus* **Krat.** [The present State of Knowledge on *T. laricivorus*.] —*Anz. Schädlingsk.* **27** pt. 11 pp. 161–166, 5 figs., 9 refs. Berlin, 1954.

Taeniothrips laricivorus Krat. & Farský is widely but irregularly distributed on European larch [*Larix decidua*] in central Europe, and outbreaks of it have occurred in Czechoslavakia [*cf. R.A.E.*, A **31** 28], Germany [*cf.* **41** 337] and Switzerland. The author gives a map showing the areas in which damage has been light or severe and discusses from his own experience in central Germany in 1952–54 and the literature the factors that favour infestation. Japanese larch [*L. leptolepis*] is apparently not attacked. The thrips has two generations a year, and only the adult females overwinter. The main hibernation sites are beneath the bud scales on the terminal shoots of spruce, and the overwintered females fly to larch when the needles have opened, generally in April, distributing themselves throughout a stand by the beginning of May. Adults of the first generation emerge in June and those of the second from mid-July until early August, except at higher altitudes, where emergence does not occur until mid-August. Hibernation sites on spruce are sought in August and September. Optimum conditions exist therefore in mixed stands of spruce and larch, although the thrips can be carried considerable distances by wind, but areas in Germany are cited in which large mixed stands of larch and spruce within forests consisting of other, mainly deciduous, trees have remained uninfested. Insecticides have hitherto proved ineffective against the thrips, but in a test in 1954, infested trees showing initial signs of die-back developed normally after a single application of Metasystox [dimethyl 2-(ethylmercapto)ethyl thiophosphate] in a band round the stems, and this also gave complete control of *Coleophora laricella* (Hb.).

Wille (H.) & Martignoni (M. E.). **Vorläufige Mitteilung über einen neuen Krankheitstypus beim Engerling von** *Melolontha vulgaris* **F.** [A preliminary Note on a new Type of Disease in Larvae of *Melolontha melolontha*.]—*Schweiz. Z. allg. Path.* **15** pp. 470–474. Basle, 1952. (Abstr. in *Z. PflKr.* **60** pt. 4 p. 204. Ludwigsburg, 1953.)

Krieg (A.). **Licht- und elektronenmikroskopische Untersuchungen zur Pathologie der Lorscher Erkrankung von Engerlingen und zur Zytologie der** *Rickettsia melolonthae* **nov. spec.** [Investigations with Light-ray and Electron Microscopes on the Pathology of the Lorsch Disease of Melolonthid Larvae and the Cytology of *R. melolonthae*, sp. n.]—*Z. Naturf.* **106** pt. 1 pp. 34–37, 2 pls., 2 figs., 11 refs. Tübingen, 1955.

In the first of these papers, the authors report that larvae of *Melolontha melolontha* (L.) (*vulgaris* F.) congregate each autumn on the soil surface in the forest district of Lorsch, to the east of Worms, and die as a result of an epidemic disease. The integument of affected individuals turns a dirty

white tinged with blue, and kidney-shaped rods are present in the haemolymph. The cells of the fat-body also show modifications. The disease, which has not been previously recorded, is referred to as Lorsch disease, and is thought to be caused by a rickettsia.

In the second paper, the internal symptoms of infection and the rickettsia-like forms found in the diseased larvae are described in detail. The organism causes necrotic histolysis of the cells of the fat-body, and death ensues in about 120 days. It does not survive on artificial culture media, but is infective for larvae of *Tenebrio molitor* L., in which cultures can be established. It is apparently a rickettsia, and closely resembles and may be identical with the species described by Dutky & Gooden in the genus *Coxiella* [*R.A.E.*, A **43** 30]. The author, however, proposes the name *Rickettsia melolonthae* for it, in spite of its filterability, since he does not consider *Coxiella* to be generically distinct from *Rickettsia*.

Fischer (M.). **Untersuchungen über den kleinen Holzbohrer** (*Xyleborinus saxeseni* **Ratz.).** [Investigations on *Xyleborus xylographus*.]—*Pflanzenschutzberichte* **12** pt. 9–12 pp. 137–180, 18 figs., 21 refs. Vienna, 1954. (With a Summary in English.)

The author gives descriptions of the mouth-parts and digestive tracts of the larva and adult female and the genitalia of both sexes of *Xyleborus xylographus* (Say) (*Xyleborinus saxeseni* (Ratz.)), describes the galleries made by it, reviews the literature on its bionomics and gives a list of the fruit and other trees infested by this Scolytid, which is widely distributed throughout the northern hemisphere. Investigations in Austria in 1951–52 showed that apricot was the main fruit tree attacked, though apple and occasionally cherry and plum were infested in the absence of it. In 1952, near Vienna, the first fresh attacks were observed on 28th April and the last on 12th May. The females bore into thick branches or trunks, and only diseased or injured trees were attacked, though infestation of healthy trees has been recorded elsewhere [*R.A.E.*, A **24** 651]. Entry is effected from sheltered sites, generally on the lower surface of a branch, and the beetles bore inward for a short distance until they reach the heartwood and then follow one of the annual rings laterally. Under favourable conditions, individual females complete their galleries within about a week, and of 38 observed in their galleries, 35 had laid 21–110 eggs each within this period. The eggs are deposited generally in clusters of 8–12, in cells sealed with frass, and hatch shortly afterwards. The larvae feed on a fungus, found in special studies to be a species of *Penicillium*, that is introduced by the ovipositing female, and the communal gallery is enlarged as they grow, the frass being removed from the entrance by the parent female. Differences in rate of development, due to overcrowding and unequal growth of the fungus, are considerable, and although pupae were observed on 17th June and newly emerged adults ten days later, about 10 per cent. of the overwintering population consisted of larvae and pupae, the latter representing only a very small proportion. In the laboratory, the pupal stage lasted about a week. Pairing occurs soon after emergence, in the galleries, and in 1952 hibernation had begun by 15th September, after the temperature had fallen below 5°C. [41°F.] for several days. The first overwintered female was observed emerging from its gallery on 18th April. There is thus only one generation a year. The ratio of males to females averaged 1:20.

A list is given from the literature of other insects found in the galleries of *X. xylographus*. Those observed by the author included various Coleoptera, some of which may have been predacious on *X. xylographus*; the Tyroglyphid,

Histiogaster carpio (Kramer), which feeds on the fungus, was also present. Unidentified nematodes were found in the larvae and adults.

As *X.* (*Anisandrus*) *dispar* (F.) and *X. xylographus* are generally found in the same tree, control experiments were carried out against both species. Deposits of DDT, BHC and parathion on filter paper were very toxic to adult females of *X. dispar* in the laboratory, but sprays containing these materials had no effect when applied in August to apricot branches infested by adults of *X. dispar* and adults and larvae of *X. xylographus*. Complete mortality was obtained when the galleries were plugged with cotton-wool soaked in carbon bisulphide and subsequently sealed, but cotton-wool soaked in liquids containing parathion or BHC gave somewhat lower mortality and was less rapid in action. Infestation can be prevented by covering the trunks and branches with paper, clay or tar, and erecting trap logs, which must be of considerable thickness and not completely dried out for use against *X. xylographus*.

IIIe Congrès International de Phytopharmacie, Paris, septembre 1952. Volume I. Discours, conférences, rapports et voeux des Commissions.—*Phytiat.-Phytopharm.* num. spéc. 1953, 208 pp., 2 pls., 1 graph, many refs. Paris, 1953. **Volume II. Communications scientifiques.** —*Op. cit.* num. spéc. 1954, 948 pp., illus., many refs. 1955.

The first volume of the proceedings of this conference includes the text of the official addresses, the reports of committees, the resolutions adopted and five lectures dealing chiefly with the action of insecticides. The 161 scientific communications presented are printed in the second volume. They are arranged in eight main sections, of which those of entomological interest are concerned with methods of testing insecticides and other plant-protection products, physical and chemical studies on them, tests of insecticides against insect pests, methods of application, and toxicological investigations.

Blunck (H.). Ed. **Tierische Schädlinge an Nutzpflanzen. 2. Teil.** [Animal Pests of Economic Plants. Part 2.]—Sorauer (P.). *Handb. Pflanzenkr.* **5,** 5. Aufl., 3. Lief., viii + 399 pp., 128 figs., many refs. Berlin, P. Parey, 1956. Price *DM.* 94.

This is the third part of the enlarged fifth edition of the fifth volume of Sorauer's textbook [*cf. R.A.E.*, A **42** 179, etc.] and contains the sections on the Heteroptera and the Homoptera other than Aphids and Coccids, which are to be dealt with in the next part. The first is by E. Otten, and the second by H. J. Müller.

Laudani (H.). **Mothproofing Woolens.**—*Soap & chem. Spec.* **31** no. 8 pp. 149, 151, 153, 177, 179, 181, 4 refs. New York, N.Y., 1955.

The value of Perthane [1,1-bis(p-ethylphenyl)-2,2-dichloroethane (ethyl-DDD)] and Strobane [a chlorinated mixture of α-pinene isomers] for the protection of woollen cloth against insects was tested in the laboratory in 1954, the test insects being larvae of *Attagenus megatoma* (F.) (*piceus* (Ol.)) and *Anthrenus flavipes* Lec. Samples of cloth were impregnated with 0·05, 0·1, 0·25, 0·5 and 3 per cent. of their weight of the compounds in acetone solution, aired for seven days and then exposed to attack by *Attagenus* larvae; some samples treated at the two highest rates were tested after being washed or dry-cleaned 1–3 times. The samples were exposed

for 28 days in open dishes at a temperature of 78–82°F. and 55–65 per cent. relative humidity, and compared with samples that had received identical treatment with DDT. Both test compounds gave complete immediate protection at 0·5 or 3 per cent. but not at 0·25 per cent., whereas DDT gave complete protection at 0·1 per cent. but not at 0·05 per cent. On samples that were attacked, the weights of excreta were in proportion to the injury to nap and warp, and none of the compounds caused significant mortality of the larvae. Light to heavy insect damage resulted after a single dry-cleaning of cloth impregnated with 0·5–3 per cent. of either compound, but there was little or none after cloth treated at the highest rate had been washed three times. Strobane appeared to be about as resistant as DDT to laundering, and ethyl-DDD somewhat less so. Ageing of ethyl-DDD for four years and of DDT for five years on the cloth appeared to have little effect on the protection afforded.

The toxicity of residues of the two materials at 25–200 mg. per sq. ft. was compared with that of lindane [almost pure γ BHC] at 25 and 100 mg., chlordane at 50 and 100 mg. and DDT at 50–200 mg. per sq. ft. by confining larvae of both species for one or 14 days on masonite board sprayed one day previously. The results showed that ethyl-DDD and Strobane were equal to DDT but slightly less effective than chlordane and considerably less so than γ BHC; no significant mortality was given by continuous exposure of *A. megatoma* for 14 days to ethyl-DDD, Strobane, DDT or chlordane at any of the rates, whereas 50 mg. γ BHC gave 80 per cent. kill. At 100 mg., the percentages of insects dead and (in brackets) dead or moribund were 0 (38) for ethyl-DDD, 0 (22) for Strobane, 0 (35) for DDT and 2 (100) for chlordane. Counts of dead and moribund larvae were somewhat higher for *Anthrenus*, but the relative effectiveness of the compounds was the same. Exposures for one day, except to γ BHC, had little effect.

To test their vapour toxicity, ethyl-DDD and Strobane were applied in acetone at 25–100 mg., γ BHC at 25 and 50 mg. and chlordane at 50 and 100 mg. per sq. ft. to the insides of glass jars of 1 U.S. quart capacity, and these were left inverted for 20 days over open-mouthed vials containing larvae of both species. Counts then showed that the percentages of *Anthrenus* larvae dead and (in brackets) dead and moribund were 28 (32) for ethyl-DDD, 22 (65) for Strobane and 90 (100) for γ BHC and chlordane, all at 50 mg. per sq. ft., and that the corresponding figures for *Attagenus* were 0 (30) and 0 (28) for ethyl-DDD and Strobane at 100 mg., and 100 (100) and 92 (100) for γ BHC and chlordane at 50 mg., as compared with 0 (0) in the controls.

FOSTER (R.). **Laboratory Observations on the Effects of Insecticides on the White Coffee Borer Beetle.**—*E. Afr. agric. J.* **21** no. 1 pp. 6–9, 7 graphs, 1 ref. Nairobi, 1955.

The investigations described were carried out with adults of *Anthores leuconotus* Pasc. collected from coffee in the Northern Province of Tanganyika in December 1954 and January 1955. Coffee twigs and foliage were provided before and after treatment, and, after treatment at 23–25°C. [73·4–77°F.], the beetles were kept at 21–25°C. [69·8–77°F.]. The insecticides used were DDT, dieldrin, endrin and chlordane in 0·5 and 2 per cent. solutions in olive oil, oil alone being used for the controls, and the liquids were applied topically by means of a micrometer syringe. The results were calculated by the use of Abbott's formula [*cf. R.A.E.*, A **13** 331]. In the first test, 25 μg. toxicant was applied to the mouthparts or right fore-tarsus and the results were based on mortality. Endrin proved the most effective, followed by dieldrin, DDT and chlordane. As the

beetles remained moribund for a considerable time before dying and none recovered from this condition, knockdown was the criterion used in the subsequent tests, and the insecticides were applied to the tarsi only, in order to relate the conditions of the tests more closely to those in the field. When the dose was 25 μg., endrin and dieldrin were found to be considerably superior to DDT and chlordane, the two latter giving 30–40 per cent. knockdown in 6–7 days and endrin and dieldrin giving 100 and 86 per cent., respectively, in 63 hours. At a dosage of 100 μg., 100 per cent. knockdown was given in 30–33 hours by endrin and dieldrin and in 65–70 hours by DDT and chlordane. When 100 μg. endrin or dieldrin was applied to males and females separately, the two sexes appeared equally susceptible, and when the dose of 100 μg. dieldrin was distributed equally between the two foretarsi, no difference in effect was observed. In tests to determine the minimum knockdown dose, 1 μg. dieldrin gave 65 per cent. knockdown in 114 hours, and 3–15 μg. gave 100 per cent. in 142 hours or less. With endrin, 5, 10, 15 and 20 μg. gave 63, 63, 78 and 81 per cent. knockdown in 52 hours, respectively. There was some indication in these last tests that the susceptibility of the beetles to dieldrin and endrin may increase with age.

Le Pelley (R.). **The *Citrus* Bud Mite, *Aceria sheldoni* (Ewing) Eriophyidae in Kenya.**—*E. Afr. agric. J.* **21** no. 1 pp. 22–24, 4 figs., 2 refs. Nairobi, 1955.

Aceria sheldoni (Ewing), which was described from *Citrus* in California in 1937 [*R.A.E.*, A **26** 173] and also occurs in Hawaii [**30** 429], Australia [**34** 126, etc.], Italy [**42** 356], Turkey [**40** 222], Cyprus, Israel, and the Lebanon, was observed at Rustenburg, in South Africa, in 1952 and is known to be present also in the northern Transvaal and Southern Rhodesia. It was observed in Kenya in 1955 on grapefruit and lemon in a small planting, and subsequent investigations showed it to be widespread throughout the colony. It was found on young nursery stock only recently imported from South Africa, but it appears from the condition of old lemon trees near Nairobi to have been present in Kenya for many years. The damage was severe on grapefruit, less so on lemon and occasional on navel oranges. No detailed experiments on control of the mite have yet been carried out, but petroleum-oil sprays, which are used locally against Coccids, proved fairly effective alone or with the addition of nicotine sulphate, though numerous applications appeared to be necessary against severe infestations. Malathion had no effect, but Chlorobenzilate [ethyl 4,4′-dichlorobenzilate] at 0·1 per cent. in an emulsion spray showed promise, though it did not give complete mortality.

Dexter (P. M.). **The Control of Light Brown Apple Moth (*Tortrix postvittana*) of Canning Peaches with Dichlorodiphenyl Dichloroethane (D.D.D.).**—*J. Aust. Inst. agric. Sci.* **20** no. 3 pp. 182–184. 3 refs. Sydney, 1954.

Austrotortrix (*Tortrix*) *postvittana* (Wlk.) has become increasingly important on peach, including late varieties for canning, in the Goulburn Valley of Victoria in recent years, possibly owing to the heavy applications of DDT, which is of no value against it [*R.A.E.*, A **39** 134], that are made for the control of *Cydia molesta* (Busck). In addition to causing premature fruit fall, the larvae damage the surface of the fruits and facilitate the rapid

spread of fungous disease. Lead arsenate, which affords control on apple and pear, cannot be used on peach owing to the risk of defoliation, and since DDD gave satisfactory results in New Zealand [*cf.* **41** 25], the value of this material was investigated. Sprays containing DDD, lindane [almost pure γ BHC], dieldrin and endrin, all at 0·1 per cent. were applied five times at peaks of adult emergence, as determined from lure traps, to single trees that also received the usual DDT sprays against *C. molesta*. Only DDD and endrin gave significant control at harvest, when the percentage of fruits damaged by *A. postvittana* was reduced from about 6·4 to 0·8 by both. In a further test in larger blocks, which were also sprayed five times at peaks of emergence, sprays of 0·1 per cent. DDT, 0·1 per cent. DDD and the two together resulted in 11·3, 0·07 and 0 per cent. infestation by *A. postvittana* at harvest and in 1·1, 0·5 and 0·42 per cent. by *C. molesta*. Further experiments are necessary before DDD can be recommended for use against both insects.

PAPERS NOTICED BY TITLE ONLY.

AUCLAIR (J. L.) & MALTAIS (J. B.). **Paper Partition Chromatography in entomological Research.**—*Canad. Ent.* **86** no. 8 pp. 377–381, 2 figs., 17 refs. Ottawa, 1954.

GRESSITT (J. L.). **Insects of Micronesia. Vol. 17 no. 2. Coleoptera: Cerambycidae.**—pp. [+1] 61–183, 33 figs., 1 map. Honolulu, Bishop Mus., 1956. [*Cf. R.A.E.*, A **43** 345, 450.]

MENEZES MARICONI (F. A.) & ZAMITH (A. P. L.). **Contribuição para o conhecimento da *Brassolis sophorae* (Linnaeus 1758), *B. astyra* Godart, 1821 (Lepid.-Brassolidae) e de seus inimigos naturais.** [*B. sophorae* and *B. astyra* on Coconut, *Copernicia cerifera*, etc., and their Parasites in Brazil.]—*An. Esc. Agric. Queiroz* **11** pp. [2+] 161–214, 1 fldg. table, 8 pls., 79 refs. Piracicaba, 1954. (With a Summary in English.) [For shorter account see *R.A.E.*, A **42** 53.]

GUPTA (B. D.). **A Review of Publications on Sugarcane Pests in India (1934–54)** [318 titles with brief abstracts].—[3+] ii + 80 + xv pp. Delhi, Minist. Fd Agric. India, 1955.

NIZAMLIOĞLU (K.). **Süne'nin salgın yapma sebepleri üzerine yeni açıklamalar ve Diyarbakır-Urfa bölgesinde süne (*Eurygaster integriceps* Put.) nin ökoloji, epidemiyoloji ve mücadelesi.** [Recent Details on the Epidemiology of *E. integriceps* and on its Epidemiology, Ecology and Control on Cereals in 1955 in the Districts of Diyarbakir and Urfa.]—*Koruma Tarım Îlâçları A.Ş. Neşr.* no. 4, 26 pp., 15 figs., 17 refs. Istanbul, 1955. (With a Summary in English.) [For abstract see *R.A.E.*, A **44** 44.]